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NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

N5813

MANAGEMENT CONTROL OF FACILITY WARRANTIES
IN NAVFAC CONSTRUCTION CONTRACTS

by

Thomas William Nielsen

December 1987

Thesis Advisor: J.M. Fremgen

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T239107

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

1a REPORT SECURITY CLASSIFICATION UNCLASSIFIED	1b RESTRICTIVE MARKINGS
2a SECURITY CLASSIFICATION AUTHORITY	3 DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution is unlimited
2b DECLASSIFICATION/DOWNGRADING SCHEDULE	
4 PERFORMING ORGANIZATION REPORT NUMBER(S)	5 MONITORING ORGANIZATION REPORT NUMBER(S)
6a NAME OF PERFORMING ORGANIZATION Naval Postgraduate School 6b OFFICE SYMBOL (If applicable) 54	7a NAME OF MONITORING ORGANIZATION Naval Postgraduate School
6c. ADDRESS (City, State, and ZIP Code) Monterey, California 93943-5000	7b ADDRESS (City, State, and ZIP Code) Monterey, California 93943-5000
8a. NAME OF FUNDING SPONSORING ORGANIZATION 8b OFFICE SYMBOL (If applicable)	9 PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (City, State, and ZIP Code)	10 SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO / PROJECT NO / TASK NO / WORK UNIT ACCESSION NO

11 TITLE (Include Security Classification)
MANAGEMENT CONTROL OF FACILITY WARRANTIES IN NAVFAC CONSTRUCTION CONTRACTS

12 PERSONAL AUTHOR(S)
Nielsen, Thomas W.

13a TYPE OF REPORT Master's Thesis	13b TIME COVERED FROM _____ TO _____	14 DATE OF REPORT (Year, Month, Day) 1987 December	15 PAGE COUNT 107

16 SUPPLEMENTARY NOTATION

17 COSATI CODES		
FIELD	GROUP	SUB-GROUP

18 SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
Warranty, Guaranty, Construction, Contracts, Facility Maintenance, Facility Management

19 ABSTRACT (Continue on reverse if necessary and identify by block number)

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20 DISTRIBUTION/AVAILABILITY OF ABSTRACT ☐ UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT ☐ DTIC USERS	21 ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED
22a NAME OF RESPONSIBLE INDIVIDUAL J.M. Fremgen	22b TELEPHONE (Include Area Code) 408 646 2644 22c OFFICE SYMBOL 54FM

DD FORM 1473, 84 MAR 83 APR edition may be used until exhausted
All other editions are obsolete

SECURITY CLASSIFICATION OF THIS PAGE

☆ U.S. Government Printing Office: 1986-606-243

Approved for public release; distribution is unlimited

Management Control of Facility Warranties in NAVFAC Construction Contracts

by

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Lieutenant Commander, United States Navy,
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Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

from the

NAVAL POSTGRADUATE SCHOOL
December 1987

ABSTRACT

This thesis investigates Naval Facilities Engineering Command policies and procedures with respect to construction contract warranties and the extent to which Navy construction contract warranties are enforced in the field. Throughout contract development and administration NAVFAC warranty policy is found to be well stated and consistent with Federal policies. Procedures used to comply with NAVFAC contracting policy are well defined and they are followed by contracting field activities. However, uniform warranty management controls are not used by nor readily available to activities that must manage warranties after construction has been completed. There is a potential for high cost facility deficiencies under warranty to be corrected at Government expense. Recommendations to correct this situation are proposed and discussed.

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TABLE OF CONTENTS

I. INTRODUCTION----------6
A. BACKGROUND----------6
B. RESEARCH QUESTIONS----------7
C. THESIS CONTENT----------9
D. SUMMARY OF FINDINGS----------11
II. DEFINITIONS, POLICIES, AND PROCEDURES----------13
A. APPROACH----------13
B. WARRANTY DEFINITION----------14
C. ADVANTAGES AND DISADVANTAGES----------14
D. WARRANTY POLICIES AND PROCEDURES: CONTRACTUAL PHASE----------15
E. WARRANTY POLICIES AND PROCEDURES: OPERATION & MAINTENANCE PHASE----------25
F. SUMMARY----------34
III. RESEARCH DATA----------35
A. FIELD INVESTIGATION BACKGROUND----------35
B. SAMPLE SELECTION----------36
C. PROCEDURES----------36
D. DESCRIPTION OF WARRANTY MANAGEMENT PROCEDURES BY ACTIVITY----------38
E. DESCRIPTION OF DATA OBTAINED FROM SAMPLE PROJECTS----------45
F. ACTIVITY VI DATA----------53
G. POST OCCUPANCY EVALUATION----------54
H. SUMMARY----------55
IV. ANALYSIS----------59
A. APPROACH----------59
B. ANALYSIS OF POLICY AND PROCEDURES----------59
C. ANALYSIS OF FIELD DATA----------73
D. SUMMARY----------82

V. SUMMARY AND RECOMMENDATIONS----------83
A. APPROACH----------83
B. SUMMARY OF FINDINGS----------83
C. RECOMMENDATIONS----------88
APPENDIX A WARRANTY OF CONSTRUCTION CLAUSE----------95
APPENDIX B CONSTRUCTION CONTRACTOR PERFORMANCE EVALUATION REPORT----------96
APPENDIX C SAMPLE WARRANTY PROBLEM LETTERS----------98
APPENDIX D ROICC PROJECT CLOSEOUT CHECKLIST---------100
APPENDIX E SAMPLE TURNOVER LETTER----------102
APPENDIX F SAMPLE ACCEPTANCE LETTER----------103
LIST OF REFERENCES----------104
INITIAL DISTRIBUTION LIST----------106

I. INTRODUCTION

A. BACKGROUND

Each year hundreds of millions of dollars of Navy construction are put into place by contract through the Military Construction Program, special projects, minor construction, maintenance, repair, and alteration. Construction contract warranties on workmanship, materials, and equipment help protect the government from substandard end products by requiring suppliers to stand behind their work and correct unacceptable performance. However, to insure warranties are enforced, facility managers must be aware of and manage warranty requirements.

Two different organizations play separate and distinct roles in any substantial Navy construction contract and subsequent occupancy or use of facilities. Resident Officers in Charge of Construction (ROICC's) manage construction contracts to insure construction is completed on time, within budget, and according to design and performance specifications. Public Works Departments (PWD's) are responsible for the proper operation and maintenance of facilities once they have been accepted from the contractor. At the time of acceptance, therefore, responsibility for a facility passes from one organization (ROICC) to another (Public Works).

Complete and accurate warranty information must be passed from the Contracting Officer to the Public Works Department when completed construction is turned over to the using activity. Within the PWD, controls must be in place to insure various divisions are aware of warranty provisions and that warranties are properly

managed and enforced. Proper transfer of information and adequate warranty management control help prevent Government performance of repair work that should be completed by the contractor under warranty.

Warranty information must be communicated to those who need it. Failure to do so may result in substantial unnecessary cost to the Government. Management controls must be in place in order to insure warranty information is passed from Contracting Officers to Public Works Departments and then disseminated to appropriate personnel within those departments.

This thesis investigates Naval Facilities Engineering Command (NAVFAC) contracting and maintenance procedures with respect to warranty enforcement. Particular emphasis is placed on how provisions of warranties are communicated from ROICC's to accepting Public Works Departments and how warranty requirements are enforced within Public Works Departments.

B. RESEARCH QUESTIONS

The thesis investigates the following primary research questions: Are NAVFAC policies and procedures with respect to construction contract warranties consistent with Federal Government policies, and to what extent are Navy construction contract warranties for facilities and equipment enforced after acceptance by Public Works Departments from contracting agencies (ROICC's)?

In answering the primary research questions, management of construction contract warranties was examined with regard to key factors that should be considered when including warranty clauses in construction contracts. These factors are divided into

two categories, those pertaining to development and administration of construction contracts (warranty factors in contracting), and those pertaining to warranty enforcement during operation and maintenance of the accepted end product (warranty factors in operation and maintenance). The factors are listed below:

Warranty factors in contracting:

1. A policy concerning the use and enforcement of warranties must be established.
2. A decision must be made whether to use standard industry warranties or develop specialized warranties on a case-by-case basis.
3. A decision must be made as what shall be under warranty and what the warranty period shall be.
4. Warranty provisions must be developed and incorporated into the contract in such a manner that they are clearly understood by the contract administrators and the contractor.
5. The warranty period must be specified in the contract.
6. Rights and obligations of the government and the contractor must be included in the warranty provisions.
7. Proper installation and operation of materials and equipment installed under the contract must be verified prior to acceptance from the contractor.
8. As-built conditions must be confirmed and documented at the time of acceptance of construction from the contractor.
9. Operation, maintenance and warranty data must be obtained for materials and equipment under warranty and transmitted to operation and maintenance personnel.
10. Lines of communication and procedures for contractor notification of warranty problems must be established.
11. The government must have some kind of leverage it can use to insure the contractor honors the warranty provisions of the contract or a method whereby costs to correct warranty deficiencies can be recovered from the contractor.

Warranty factors in operation and maintenance:

1. There must be a procedure for accepting newly completed construction from the ROICC.
2. The provisions of the warranty must be known.

3. The PWD must be aware of proper operation and maintenance procedures to preclude inadvertent voiding of the warranty.

4. The PWD must know what is under warranty.

5. The warranty period must be known.

6. The PWD must have a procedure and point of contact for referring warranty problems to the contractor or the ROICC.

7. The PWD must have a network to identify work requirements.

8. The PWD must have a way to screen work requirements to identify those that might be covered by warranty and have controls in place to insure work requirements actually do get screened for possible warranty application.

9. The PWD must have a way to document and track warranty problems.

10. There must be a decision making entity that can determine whether a work requirement is covered by warranty and if it should be pursued under the warranty provisions of the contract or should be performed in house and the cost absorbed.

In order to address these factors, research was conducted in two phases, NAVFAC contractual warranty requirements and field activity practices and results.

C. THESIS CONTENT

The substance of this thesis is presented in the remaining four chapters.

Chapter II provides definitions of warranty and discusses the advantages and disadvantages of using warranties in procurement contracts. The chapter then describes the policies and procedures presently in place to govern warranty management. Guidance from the Federal Acquisition Regulations, Department of Defense Supplement to the Federal Acquisition Regulations, NAVFAC Contracting Manual, an Engineering Field Division construction contract administration manual, pertinent Public Works manuals and publications, and pertinent instructions and directives is presented and described. The descriptions are divided into policies and procedures governing contract development and

administration and then policies and procedures governing operations and maintenance of facilities as they pertain to warranty management. At the end of the chapter, the NAVFAC facility Post Occupancy Evaluation Program is briefly described.

Chapter III presents research data obtained from field visits to five activities and data obtained from a sixth activity through telephone interview and written correspondence. The chapter describes the research procedures used to investigate warranty management at each activity, describes the actual methods used by each individual activity ROICC and PWD to manage construction contract warranties, and then presents contract, maintenance, and warranty data obtained from twelve construction projects selected during the five field visits. Data concerning warranty management at the sixth activity are presented separately. Since the sixth activity uses an approach to managing construction contract warranties different from the five that were actually visited, data could not be collected or presented in the same format. Data are also presented from sample facility Post Occupancy Evaluations.

Chapter IV provides an analysis of the information presented in Chapters II and III. The chapter first identifies the key factors that should be considered when specifying construction contract warranties and when managing them. Again, the factors are grouped into contracting factors and operation and maintenance factors. The data collected in chapters II and III are then compared against the factors, and strengths and weaknesses in NAVFAC warranty management identified and discussed.

Chapter V then summarizes the strengths and weaknesses of warranty management in NAVFAC

construction contracting, breaking the summary into two components, procedures with respect to warranty factors in contracting and procedures with respect to warranty factors in Public Works Management. The chapter concludes with recommendations for NAVFAC to reinforce existing strengths in warranty management and to reduce the weaknesses.

D. SUMMARY OF FINDINGS

From the research conducted, it has been determined that throughout the contractual phase of warranty management, NAVFAC warranty policy is well stated and consistent with Federal policies. The controls currently in place insure that policy is complied with. Requirements, procedures, and responsibilities are clearly defined in the various sources of guidance governing for contract management and are followed in practice.

During the turnover of facility custody from the contractor to the using activity PWD and afterwards, the guidance for managing construction contract warranties is not clear-cut. No specific procedures for PWD's to follow in accepting construction from the contractor and managing construction contract warranties were identified.

It was found that individual activity PWD's take their own individual approaches to managing construction contract warranties. Generally speaking, the smaller the activity, the more informal the approach to warranty management. The tendency found during this study was to take a common-sense or intuitive approach to warranty management and to minimize documentation and administrative burden in managing warranties. When warranty deficiencies are identified, a conscious decision is made whether or not

to enforce the warranty, weighing costs against benefits of enforcing the warranty.

It was found that individual activities manage construction contract warranties to the extent necessary to insure potentially high cost problems are identified and referred to the contractor or ROICC for resolution. When the cost to pursue contractor resolution of warranty problems is estimated to exceed the cost to correct the problem in-house, the problem is corrected in-house. However, because of the lack of warranty management guidance readily available to PWD's, warranty management procedures used in practice leave a potential for high cost warranty problems to be overlooked and not referred to the contractor for resolution.

As a result of the study, recommendations to improve warranty management in NAVFAC are provided in Chapter V. These recommendations can be summarized as follows: (1) Improve the process by which facilities are turned over from the contractor to the PWD by clarifying the turnover process and improving communication between contractor, ROICC, and the PWD. (2) Ensure that PWD's continue to establish their own warranty management procedures to meet their own individual needs. (3) Have NAVFAC compile important information that warranty managers should be aware of, as well as tips for maximizing the effectiveness of a warranty management program, into a handbook for warranty managers.

II. DEFINITIONS POLICIES AND PROCEDURES

A. APPROACH

This chapter examines the various policies, criteria and guidance that affect NAVFAC construction contract warranty management. After a definition and general discussion of what a warranty is, the examination is conducted by dividing the warranty management process into contractual, and maintenance and enforcement phases. The flow of policies, criteria, and guidance affecting each phase is then presented. The purpose is to familiarize the reader with the role warranties play in NAVFAC contracting and to present the policies and administrative controls that govern management of warranties in NAVFAC construction contracting.

As discussed in the preceding paragraph warranty management for Naval Facilities Engineering Command (NAVFAC) construction contracts can be broken into two separate phases. During the contractual phase, a decision is made whether or not to use a warranty, warranty provisions are selected and included in the contract, warranty information is obtained from the contractor, and the construction project is completed. At the completion of the contractual phase the end product is accepted from the contractor by the Resident Officer in Charge of Construction and it is turned over to the using activity Public Works Department for maintenance and operation. The turnover process begins the second phase, that of maintenance and warranty enforcement. During this phase the Public Works Department is responsible for identifying deficiencies correctable under warranty, notifying the contractor,

and insuring that the government's rights under the warranty clauses of the contract are upheld. In the event of disputes between the government and the contractor or failure of the contractor to perform warranty work, the Public Works Department can obtain assistance from the contracting officer.

B. WARRANTY DEFINITION

A warranty is generally defined as

> ...assurance, explicit or implied, of something having to do with a contract, as of sale; especially, the seller's assurance to the purchaser that the goods or property is or shall be as represented. [Ref. 1]

In Department of Defense acquisition terminology, a warranty is defined as

> ...a commitment provided by a supplier to deliver a product that meets specified standards for a specified period of time, and an obligation of the contractor undertaken through a fixed-price contract to repair or replace equipment (workmanship) found to be defective during the period of warranty coverage. [Ref. 2]

The Federal Acquisition Regulation (FAR) defines a warranty as

> a promise or affirmation given by a contractor to the Government regarding the nature, usefulness, or condition of the supplies or performance of services furnished under the contract. [Ref. 3:para. 46.701]

C. ADVANTAGES AND DISADVANTAGES

There are definite advantages to including warranty clauses in contracts. The contractor is motivated to improve quality and reliability. As quality and reliability increase, the likelihood of the contractor having to perform repair or replacement under warranty decreases as does his cost for performing such work. Risk to the buyer is reduced since the contractor will be required to correct deficiencies occurring during the warranty period. Also, life cycle costs can be decreased through increased quality and reliability.

The advantages of warranties, however, must be weighed against some disadvantages. Disadvantages include higher up-front costs for increased contractor effort in the areas of quality and reliability, administrative costs of monitoring and managing warranties, risk of warranty compromise through improper maintenance or operation, extended downtime or reduced operational capability while waiting for contractor correction of warranty deficiencies, and increased opportunity for dispute and litigation between the customer and contractor.

D. WARRANTY POLICIES AND PROCEDURES: CONTRACTUAL PHASE

Title 10 United States Code (USC) is the basic regulatory authority employed by the Armed Forces for the acquisition of supplies, equipment, construction, and all the various services required to support the nation's military establishment. [Ref. 4]

As an extension of Title 10 USC, the Federal Acquisition Regulation (FAR) system was developed and established by the Office of Federal Procurement Policy Act of 1974. The FAR is the primary regulation used by Federal agencies for acquisition of supplies and services with appropriated funds. The purpose of the FAR is to provide simplicity and consistency in Federal acquisition. To accomplish this the FAR prohibits separate agencies from developing internal regulations that unnecessarily repeat, paraphrase, or replace current Federal Acquisition Regulations. Thus, in the Department of Defense (DOD) contracting, the FAR is the primary source of guidance and takes precedence over other procurement regulations and procedures. Within the DOD the Defense Federal Acquisition Regulation System (DFARS) amplifies and supplements the FAR with DOD FAR Supplements. Within the Naval Facilities Engineering Command (NAVFAC), which is responsible for all Navy construction contracting, the NAVFAC P-68

Contracting Manual further amplifies and supplements guidance established by the FAR and DFARS.

1. FAR Policies on Contract Warranties

Subpart 46.7 of the FAR addresses contract warranties. Subpart 46.702 states:

> The principal purposes of a warranty in a Government contract are (1) to delineate the rights and obligations of the contractor and the Government for defective items and services and (2) to foster quality performance.
>
> Generally a warranty should provide (1) a contractual right for the correction of defects notwithstanding any other requirement of the contract pertaining to acceptance of the supplies or services by the Government; and (2) a stated period of time or use, or the occurrence of a specified event, after acceptance by the Government to assert a contractual right for the correction of defects. The benefits to be derived from a warranty must be commensurate with the cost of the warranty to the Government. [Ref. 3:para. 46.702]

The FAR further states that the use of warranty clauses is not mandatory and that the following factors must be considered by the contracting officer before including a warranty clause in a contract:

1. The nature and use of the supplies or services including complexity and function, degree of development, state of the art, end use, difficulty in detecting defects, and potential harm to the Government if the item is defective.
2. The cost of the warranty, including the contractor's charge for accepting the liability of a warranty, as well as the Government's cost to administer and enforce a warranty.
3. The Government's ability to enforce the warranty must be considered and assurance obtained that an adequate system to do so exists.

Other considerations include:

1. Whether trade practice customarily provides a warranty in a given situation, and end cost stays constant regardless of whether or not a warranty clause is included.
2. Whether the contractor's charge for assuming the liability of a warranty can by offset by reducing quality assurance requirements when the warranty provides adequate assurance of a satisfactory product. [Ref. 3:para. 46.703]

When warranties are used by contracting officers the FAR requires the warranties to clearly

state the following: the exact nature of the item, components, and characteristics; the extent of the contractor's warranty; scope and duration of the warranty; and specific remedies available to the Government in the event of contractor non-compliance.

The FAR provides guidelines to be used by contracting officers in preparing warranty terms and conditions. First, in general, the contractor's liability extends to deficiencies discovered during the warranty period and is subject to proper maintenance and operation by the government. Second, in correcting warranty deficiencies the warranty should at a minimum permit the government to obtain monetary compensation, require the contractor to repair or replace the defective item, or have the defect corrected at the contractor's expense. Third, the time period of the warranty must be clearly specified and take into consideration the estimated useful life of the item, the nature of the item, and trade practice. Fourth, the warranty must specify a reasonable time for notifying the contractor of defects, taking into consideration the time necessary to discover defects and to take the administrative steps to report the defect to the contractor.

The FAR also provides a sample clause entitled "Warranty of Construction" that may be included in fixed price construction contracts when the use of a warranty clause has been decided upon by an agency. (See Appendix A.)

2. DOD FAR Supplement Policies on Contract Warranties

The Department of Defense FAR Supplement provides additional guidance amplifying FAR requirements as they apply to DOD acquisitions.

Section 46.7 of the DOD FAR supplement discusses warranties.

The general principles provided by FAR subpart 46.7 are extended by adding three principles as follows:

> Planning is an essential step in obtaining an effective warranty and should begin early enough to address warranty requirements during the development of the item.
>
> The acquisition cost of a warranty may be included as part of an item's price or may be set forth as a separate contract line item.
>
> Agencies shall establish procedures to track and accumulate data relative to warranty costs. [Ref. 5:para. 46.702]

DOD criteria for use of warranties are discussed in the DOD FAR Supplement. Except for procurement of weapon systems for which warranties are mandatory in accordance with 10 USC 2403, policy and procedures are the same as those provided in FAR 46.7. Purchasing office heads must approve the use of warranty clauses except in four situations. One of the situations applies to warranties contained in Federal, military, or construction specifications applicable to a given construction contract. The other three situations do not apply to NAVFAC construction contracting.

3. NAVFAC P-68 Contracting Manual Policies on Warranties

The NAVFAC P-68 is the guidance that NAVFAC uses to supplement the FAR and DOD FAR Supplement in construction contracting. The P-68 addresses specific situations that are common to or unique in construction contracting. In the area of warranty management, there are three areas where the P-68 provides specific guidance and procedures. They are warranties and warranty clauses, construction contractor performance reports, and acceptance of construction.

Section 4-218 of the P-68 addresses contract warranties. NAVFAC warranty policy is clearly stated in section 4-218.1 of the P-68, Warranty General Policy:

> Except where a warranty provision is included in the standard contract forms, it is the policy of NAVFACENGCOM not to include special warranty provisions. Past experience has established that warranties increase contract costs while not significantly increasing the ability of the Government to obtain corrective action or reimbursement for obtaining corrective action from other sources than the contractor. [Ref. 6:para. 4-218.1]

Contracting officers are permitted to include warranty clauses which are standard or customary in the trade provided there is reasonable assurance that such a clause will not increase the contract price and that the inclusion of the clause is in the best interest of the Government.

The P-68 places responsibility for warranty enforcement upon the facilities' users or the Public Works Departments. If a contractor does not honor his contractual obligations in performing warranty work, then the contracting officer must initiate action to resolve the situation. This is done by either compelling the contractor to perform or by obtaining compensation. Contracting officers are also advised to insure that users are aware that the warranty clause survives contract close-out, thus placing a continued obligation upon the contractor.

Section 6-206 of the P-68 addresses contractor performance reports.

> Contractor performance reports are valuable contract records and should be prepared by qualified personnel in a careful and conscientious manner. These reports must be based on factual rather than subjective data. These reports frequently form the basis for the selection of contractors for the accomplishment of critical work. They are essential in findings of nonresponsibility for contractors that have done prior work for NAVFACENGCOM. OICC's are responsible for assuring evaluation reports are promptly and accurately completed and distributed. Unless the contractor correctly points out factual errors, performance valuation reports are not to be

revised merely to meet contractor objections; rather, the contractor's comments are to be attached to the evaluation report. [Ref. 6:para. 6-206]

For construction contracts the P-68 requires contractor evaluations under the following circumstances:

1. The contract value is over $200,000.
2. The contract value is over $10,000 and performance was either outstanding or unsatisfactory in any element of performance.

Performance evaluations are made by the ROICC at the time of acceptance, using a standard format entitled "Construction Contract Performance Evaluation Report". (See Appendix B.)

Section 6-501 of the P-68 addresses acceptance of construction. The section requires that facilities constructed be in first-class operating condition and meet contract specifications at the time of final acceptance. At the time of acceptance, all necessary inspections and tests should be complete to insure the facility performs as intended. Contracting officers and the using activity Commanding Officer are required to conduct a formal inspection of all work performed under the construction contract for contracts in excess of $50,000 prior to acceptance from the contractor. For contracts under $50,000 the same requirements apply except they may be done informally.

4. Standard Contract Clauses

NAVFAC construction contract specifications include a package of standard contract clauses known as "boiler plate" or "General Provisions." The standard package fulfills FAR requirements to address certain issues in government contracting. Clause 60, Warranty of Construction, addresses construction contract warranties and is a reproduction of the FAR sample clause "Warranty of Construction". (See Appendix A.)

NAVFAC construction contract specifications also include a section entitled "Additional General Paragraphs", which serves to amplify or clarify the standard contract clauses as they may apply to a given contract. This section also describes standard procedures to follow for things such as information submittals, contractor use of utilities, contractor storage areas, utility outages, excavation and burning permits, and storm protection. Although these standard paragraphs are modified in each contract to fit the specific situation, they follow a fixed format. Also, the overall intent and meaning of the additional general paragraphs is generally consistent.

The technical sections of specifications describe configuration and performance requirements for specific equipment, installations, or materials. In some cases, the technical sections address warranties. For instance, this is a standard procedure in roofing specifications. As a rule, commercial roof installations carry a minimum five year warranty. Because the five year warranty results in no additional expense to the government, it has been adopted as a standard part of roofing technical specifications. Roofing, however, has proven to be the exception to the rule; deviation from the standard warranty clause found in the standard contract clauses is rare.

5. Engineering Field Division Policies and Procedures on Warranties

NAVFAC construction contracting falls under the jurisdiction of six geographic Engineering Field Divisions (EFD) responsible for design, award, and contract management of Navy construction contracts world-wide. Each EFD is responsible for all phases of design and construction contracting in its geographic area. Using the FAR, DOD FAR Supplement, NAVFAC P-68,

and good management practices, each EFD develops guidelines for field activities in its geographic area and typically assembles them in ROICC manuals.

As an example, the ROICC manual published by Western Division, Naval Facilities Engineering Command (WESTNAVFACENGCOM) is used. WESTNAVFACENGCOM is the EFD which holds jurisdiction over the field activities examined by this study. The manual is organized by contract stages. The area dealing with project turnover and warranty management falls under "post award" actions.

Policy for final acceptance and turnover of new construction from the contractor to the government requires ROICCs to establish procedures to insure that local Commanding Officers are given an opportunity to participate in final acceptance inspections. Contracts over $25,000 must have formal final inspections during which Commanding Officers, users, and customers have the opportunity to participate prior to final acceptance. At the time of turnover, the ROICC is to provide the user with a set of contract drawings marked up to indicate actual "as-built" conditions for customer use in maintenance and operation.

As suggested by the FAR sample warranty clause and NAVFAC policy, the warranty on construction is typically one year. The one year period begins with the date of final acceptance from the contractor or the date of government possession, whichever comes first.

The contractor's obligations under the warranty clause are interpreted as follows in the warranty policy:

> The contractor is required to remedy at his own expense any such failure to conform, any defect, or any damage to the Government's real or personal property resulting from the breach of warranty. The contractor is also required to restore any of the construction work damaged in fulfilling the terms of the warranty clause, and thereafter, warranty any

corrections for an additional year. [Ref. 7:para. 4.2.33.1.a]

The ROICC manual emphasizes a significant change in roles once the government accepts construction from a contractor. Prior to final acceptance, the burden of compliance with the contract requirements lies with the contractor. The contractor must prove that materials and workmanship conform to the contract specifications before the government is obliged to accept it. However, once the government accepts construction, it inherits the burden of proof if nonconforming materials or workmanship are discovered. In the case of warranties, the government must prove not only that defects in construction exist but also that the defects fall within the scope of the warranty clause. EFD policy further states:

> Since warranty claims generally occur after the contractor has given up possession and control of the project, the Government carries the heavy burden of proof in showing that the conditions complained of were caused solely or primarily by the contractor and not by some outside condition. The contractor has the right to stop warranty compliance in the event the owner fails to implement necessary maintenance. [Ref. 7:para. 4.2.33.1.a]

Additional policy guidance is provided in discussing the government's right to warranties. Subcontractors', suppliers', and manufacturers' warranties are to be applied to the contract and, at the direction of the government, enforced by the prime contractor. The contractor is responsible for obtaining any warranties which subcontractors, suppliers, or manufacturers offer as a matter of normal practice and make them available to the government.

In a somewhat unique procedure for Navy construction contracting, the WESTNAVFACENGCOM ROICC manual discusses a new program in which guide specifications for construction contracts have been revised to require contractors to put warranty tags on equipment installed during construction and cite

specific warranty information on "as-built" materials listings. As-built material listings are data the contractor submits to the ROICC at the end of the contract. They describe manufacturer's information for materials and equipment installed during construction. Since this program commenced with design in the FY86 construction program, data concerning the program through the end of contract warranty periods were not available during site investigations conducted as a part of this study.

The procedure for handling warranty problems is described as follows:

> The normal procedure during this warranty period is for the using activity to contact the contractor directly whenever failures occur. The ROICC usually does not get involved unless the contractor fails to respond within a reasonable time frame after receipt of notice or disagrees with the using activity that failures resulted from nonconforming workmanship or defective items. For these situations, the ROICC is to investigate the problem and to advise the contractor in writing concerning corrective work which should be corrected under the contract warranty. [Ref. 7:para. 4.2.33.1.b]

The manual then provides standard formats for correspondence to the contractor and the using activity under such situations. (See Appendix C.)

The manual also describes procedures to be followed in conducting contractor performance appraisals at the end of the contract. The procedures used are the same as those described in the NAVFAC P-68, as are the forms used to report contractor performance.

The manual provides a checklist for the ROICC to follow prior to contract closeout. (See Appendix D.) Prior to final release the using agency or Public Works Department is to be provided with the following: list of warranty agents, as-built drawings, operation and maintenance manuals, shop drawings, keys, and spare parts.

E. WARRANTY POLICIES: OPERATION & MAINTENANCE PHASE

Although standard construction contract warranty requirements and procedures are clear during the contractual phase, construction contract warranties are not specifically addressed in the guidelines Public Works Departments use in the day-to-day operation and maintenance of newly constructed facilities. There are, however, definite requirements and procedures to which PWD's must conform to execute effective, efficient, and uniform facilities management throughout the Navy shore establishment. By following these procedures, individual activities have the necessary controls in place to manage construction contract warranties. Without them, control of warranties and their enforcement becomes unlikely.

Because of their importance in an activity's ability to establish a warranty management program, warranty related policies are discussed in the following paragraphs. The purpose is to familiarize the reader with the key philosophies and methods the Navy uses to maintain the shore establishment, monitor its effectiveness, and clarify how warranty management in practice fits into the overall scheme of the operation and maintenance phase.

1. DOD Policy

DOD policy states that

> Operation, maintenance, repair, and construction of DOD real property shall be performed through the most economic means without degrading mission accomplishment considering life cycle costs consistent with DOD policy. [Ref. 8:p. 2]

Activities are required to establish preventive maintenance programs to identify and resolve minor problems before they develop into major problems that may affect mission performance.

2. Responsibilities

Responsibility for Navy facility maintenance management follows the chain of command from the Chief of Naval Operations down to the individual Public Works Department.

The Chief of Naval Operations (CNO) is responsible for programming and budgeting the resources needed to acquire, operate, maintain, and dispose of land and facilities. The CNO is also responsible for establishing general policies, responsibilities, and procedures and for monitoring their execution.

Major Claimants are assigned responsibility for managing land and facilities under their command and for ensuring that adequate public works services and resources are provided to support mission requirements.

Activity Commanding Officers are responsible for the overall condition of the activities under their command. Commanding Officers must insure sufficient resources are provided for adequate facility maintenance and operation.

Activity Public Works Departments are responsible for providing the following support services to the activities which they serve: facilities planning and programming; real estate management; facility design and construction; facility maintenance, repair, alteration, and removal; equipment installation; and utility system operation and maintenance.

So the Public Works Departments can meet their responsibilities in a consistent, uniform, efficient, and effective manner, NAVFAC develops and provides management systems and technical support. The six EFD's that fall under NAVFAC support the individual activities in their assigned geographic areas. They provide technical assistance, management system

implementation, and contract support in all facets of the planning, design, construction, operation, maintenance, and repair of facilities, utilities, and pollution abatement. EFD's also provide public works technical and management support to major claimants, including evaluation of activity public works performance.

3. Sources of Guidance

In practice, there are five prime sources of guidance for public works operations, procedures, and administration. They are:

1. OPNAVINST 11000.16A, Command Responsibility for Shore Activity Land and Facilities
2. NAVFAC Publication P-318, Organization and Functions for Public Works Departments
3. NAVFAC Manual MO-321, Maintenance Management of Shore Facilities
4. NAVFAC Manual MO-322, Inspection of Shore Facilities
5. NAVFACINST 11010.64B, Responsibilities for Major Claimant Support

The following paragraphs briefly describe the purpose, scope, and key points of each source as it relates to matters that may involve warranty management and enforcement.

a. OPNAVINST 11000.16A Command Responsibility for Shore Activity Land and Facilities [Ref. 9]

OPNAVINST 11000.16A establishes the Chief of Naval Operations' responsibility for Navy controlled land and shore facilities. It sets the overall policies and philosophies for the management of the Navy shore establishment and is used as the basis for management objectives, command inspections, and performance appraisals concerning management of land and facilities.

The instruction requires commanding officers to ensure cost effective expenditure of resources in operating and maintaining facilities.

This includes preparation and execution of an annual maintenance plan, establishment and use of a planned maintenance management system, and organizing and staffing Public Works Departments along uniform, time-proven guidelines.

The Public Works Officer is responsible for providing support services that include facilities maintenance operations and facilities management support, which in turn includes continuous inspection, and job planning and estimating.

b. NAVFAC P-318 Organization and Functions for Public Works [Ref. 10]

As its title suggests, this publication presents standards for organization and staffing for Public Works Departments within NAVFAC. Generally speaking, Public Works Departments are organized into functional divisions encompassing administration, housing, engineering, facilities management, shops management, and production. The exact organization depends on the size and priorities of the Public Works Department.

Facilities maintenance responsibilities fall under two distinct divisions within the typical Public Works Department. This is based upon NAVFAC philosophy and policy that control, coordination, and evaluation of facility planning and maintenance are better administered when assigned to a staff division rather than a production division. Therefore, the Facilities Maintenance Engineering Division (FMED) is assigned responsibility for control, coordination, and evaluation of all PWD real property maintenance actions, while the Maintenance Division is responsible for actual performance of inspection, emergency work, service work, repair work, minor construction, and other maintenance tasks. In day-to-day activities, therefore, both the FMED and the Maintenance Division

are keys to identifying warranty-related facility deficiencies and initiating warranty enforcement.

The FMED is generally divided into two branches, the Work Generation Branch and the Work Management Branch. The Work Generation Branch performs facility inspections, job planning and estimating, and material identification and ordering. The Work Management Branch evaluates facilities maintenance requirements, prepares work execution plans, and determines resource requirements. The Work Management Branch is responsible for the work reception and control function which controls the processing of customer work requests, inspection reports, and emergency or service work authorizations. This function is important in identifying warranty related work since it is in the Work Management Branch where the incoming workload is screened and classified for method of accomplishment or assignment.

The maintenance division is a line division that actually performs maintenance, repair, emergency, and service work. The division is normally divided into several branches, by trade, according to workload and the nature of work performed by the division. The members of the trade branches have day-to-day experience with facilities and their various operating components. The bulk of the working knowledge of the activity facilities is with the trade branches. Maintenance Division is a major factor in identifying equipment and facility malfunctions and insuring tasks originated by the work generation branch of FMED are properly described. The trade branches can serve as a second defense in insuring warranty work is identified. Therefore, it is important they be familiar with warranty provisions and time periods.

c. NAVFAC MO-321 Maintenance Management of Shore Facilities [Ref.11]

NAVFAC MO 321 describes specific recommended procedures to follow in public works operations. It is the key document Public Works Departments follow in performing day-to-day operations. As stated in the forward to the manual,

> The primary goal of this publication is to provide a system and recommended procedures to permit cost effective, quality, and responsive real property maintenance support within available resources. [Ref. 11:p. v]

The basic objective of the manual is "optimum use of available resources directed to real property." [Ref. 11:p. 1-1]

The manual stresses several key management concepts, including separating work generation from work performance, inspecting facilities to identify maintenance and repair deficiencies, providing quality assurance, and maximizing available resources to assure acceptable public works support. Among the stated goals of facilities management are efficient use of resources, performance of proper levels of maintenance, and reduction of administrative details that interfere with the work force.

The manual describes thirteen key elements that must be controlled in order for maintenance management to be effective. Three of the thirteen key elements are important factors in whether or not construction contract warranties get enforced. They are work generation, work reception, and work input control. These elements provide a system to document, classify, and maintain the status of incoming work.

Work generation and work reception identify facility deficiencies and initiate action to correct them. The prime source of work generation is scheduled inspections. Work is also generated by customer or user requests in the form of trouble calls (verbal) or

work requests (written). Work input control as described by the manual

> ...provides basic planning and work status information from work inception to its termination or completion. It includes the actions of screening individual jobs for necessity, determining the relative urgency and programming them through the planning phases... [Ref. 11:p. 7-1]

Responsibility for work generation, work reception, and work input control falls upon the FMED director.

d. NAVFAC MO-322 Inspection of Shore Facilities [Ref. 12]

The MO-322 describes specific procedures and frequencies to be used by Public Works Departments in conducting facility condition inspections. The purpose of the MO-322 is to provide a consistent inspection procedure to

> ...accurately identify the total backlog of maintenance and repair and to quantify the negative effect on major claimant mission performance. [Ref. 12:p. v]

Each year's inspection results are consolidated by each activity in an Annual Inspection Summary (AIS), which is submitted to major claimants and used as a baseline in developing annual maintenance budgets. There are three types or levels of inspection: control inspections, preventive maintenance inspections, and operator inspections.

Control inspections are scheduled tests or examinations of facilities conducted throughout the year to determine the physical condition of facilities. Their purpose is to provide periodic inspection of facilities, check the adequacy of preventive maintenance and operator inspections, provide a source of work input, and detect and reduce over-maintenance. These inspections are performed by using standard methods and standard written reports; they cover all construction and maintenance trades. Either members of the FMED inspection branch or outside consultants

perform the inspections. Annual control inspections are mandatory.

Preventive maintenance inspections consist of examination, lubrication, minor adjustment, and minor repair of operating equipment. Preventive maintenance inspections are performed by Maintenance Division personnel. Frequency of these inspections is dependent on the effort required and the annual operation and maintenance costs for the piece of equipment in question. Annual inspection is not mandatory. Inspection is often conducted simultaneously with scheduled servicing.

Operator inspection consists of the same type of action as preventive maintenance but is performed by an assigned operator rather than a public works inspector.

Control, preventive maintenance, and operator inspections of new facilities provide an excellent opportunity to identify deficiencies that may be correctable under the warranty provisions of the construction contract that provided the facilities.

e. NAVFACINST 11010.64B Major Claimant Support; Responsibilities for [Ref. 13]

NAVFACINST 11010.64B establishes

> ...procedures and responsibilities for Engineering Field Divisions to execute tasks for major claimant support, including Facilities Evaluation and Assistance Team (FEAT) reviews. [Ref. 13:Purpose Statement]

The instruction identifies the various duties of the EFD's in supporting major claimants. From the point of view of public works operations at a specific activity, the most significant of these duties is the FEAT review.

FEAT reviews are triannual inspections conducted at individual activities by the cognizant EFD. The intent is to

> ...provide the Commanding Officer and Public Works Officer or Staff Civil Engineer with information and background on Navy-wide and claimant-wide initiatives and policy, status of Public Works programs, detailed recommendations for improvement in Public Works functions and direct assistance. [Ref. 13:Encl. (3), p. 4]

One goal of the program is to determine ways in which an activity can improve its public works program.

The instruction contains a FEAT manual which is to be used by EFD's as a guideline on how to conduct FEAT visits and assess public works effectiveness. The manual breaks the public works function into twelve categories, each with a series of detailed questions intended to evaluate the effectiveness of that category. Functional categories which concern warranty management are:

1. Facility condition assessment, facility inspection & AIS (51 questions)
2. Maintenance and repair resources and budgeting (24 questions)
3. Organization and staffing (12 questions)
4. Work control and material management (55 questions)

4. Facility Post-Occupancy Evaluation

Each year NAVFAC conducts evaluation of a limited number of newly constructed facilities in order to determine design and functional adequacy, detect design and planning deficiencies, uncover construction deficiencies, and identify systems with high maintenance costs. The purpose of the program is to find out strong and weak points of the facilities acquisition system and determine ways to improve it.

NAVFACINST 11012.139A provides the criteria for the post-occupancy evaluation program. Since 1975 approximately 110 post-occupancy inspections have been conducted. The inspections are conducted on selected facilities typical of NAVFAC construction, such as barracks, dining facilities, exchanges, utility plants, piers, and maintenance facilities, within six to twelve

months of original occupancy. Information is collected on functional adequacy, design adequacy, existence of construction deficiencies, detection of high maintenance cost items, and detection of deficiencies in sponsor planning.

In documenting post-occupancy evaluation, a report is issued providing information on deficiencies which may be corrected under warranty provisions, latent deficiencies that may be corrected with available funds, design/specification modifications which should be incorporated in future similar projects, modifications which should be made in design criteria, modifications which should be made in sponsor planning requirements, and adequacy of maintenance manuals. [Ref. 14]

F. SUMMARY

This chapter has described the key policies and requirements that pertain to NAVFAC construction contract warranties. The policies and regulations presented form the basis for warranty management at field activities. Chapter III expands the area of study to include actual warranty management procedures used in the field and the effects of those procedures.

III. RESEARCH DATA

A. FIELD INVESTIGATION BACKGROUND

The purpose of this chapter is to present warranty management data collected from various field activities. This data along with that presented in Chapter II are analyzed in Chapter IV and are the basis for the recommendations in Chapter V.

Field investigations were conducted at five different activities and data obtained from twelve construction projects. Additional data were obtained from a sixth activity which was not visited.

There were three purposes for field investigation. The first was to determine warranty management procedures and policies employed by Resident Officer in Charge of Construction (ROICC) offices, and Public Works Departments (PWD), and then examine controls used to insure warranty work is identified and referred to contractors for correction.

The second purpose was to examine maintenance history for construction projects that recently had warranty periods expire and to collect data pertaining to project cost, number of maintenance items, cost of maintenance items, number of warranty referrals made to the contractor or ROICC, and number and cost of maintenance items performed by the PWD likely to have been covered by warranty (referred to as questionable items).

The third purpose of field investigation was to use the data obtained to determine (1) the maintenance cost during warranty period as a percent of construction cost, (2) the cost of questionable items as a percent of total maintenance cost and construction cost, and

(3) the number of questionable items as a percent of total maintenance items performed during the warranty period.

B. SAMPLE SELECTION

The sampling strategy used was to select activities within a reasonable distance from Monterey as samples. Activities of various sizes were chosen so information could be collected from a variety of staffing and workload situations. Activities studied are rated in accordance with a U.S. Navy Civil Engineer Corps Zero Base Study conducted in 1986. This study classifies Public Works activities in modules based upon several rating factors. The major factors used are the number of Public Works personnel, total Public Works funding, and current plant value of the entire activity. Module classifications range from 1 to 6, 1 representing the largest Public Works activities and 6 representing the smallest. [Ref. 15]

Project selection was based on construction work that was easily separated from other facilities or systems at the activity and that had recently had warranties expire. Recent warranty periods were desired because (1) current management practices and staffing would apply to the projects selected and (2) data would be more readily available for recent projects.

C. PROCEDURES

The procedures used to obtain information from ROICC offices were as follows:

1. Review project files and identify projects that recently had warranty periods expire and were distinct facilities or systems that would permit

easy identification of maintenance history from the PWD.

2. Retrieve from the project files of each selected contract the contract title, project scope, cost, warranty period, building number, and warranty items referred to the ROICC from the PWD.
3. Interview key personnel to determine procedures for turning completed construction over to customers or the PWD for resolving problems occurring during the warranty period and managing warranties in general.
4. Collect copies of pertinent local instructions, policies, and directives.

The procedures used to obtain information from PWD's were as follows:

1. Meet with maintenance managers to determine procedures for maintenance and warranty management. Determine how warranty work is identified, how warranties are enforced, and how warranty work is tracked. Discuss problems with enforcement and general philosophies.
2. For projects identified at the ROICC office, retrieve and study maintenance history data. Determine the amounts of maintenance items, maintenance cost, questionable items, and questionable item cost. This was done by examining work requests and service calls for each project during the warranty period. Based on the descriptions of the various maintenance items provided by work request and service call history, work items that might be covered under the warranty provisions of the contract were highlighted. These items were then reviewed with the warranty manager for confirmation that

they were likely to fall under the contract warranty provisions. Those work items confirmed were classified as "questionable" items--that is items of work performed by the PWD that may have been assignable to the contractor to perform under warranty.

3. Collect copies of pertinent local instructions, policies, and directives that warranty managers use in day to day operations.

D. DESCRIPTION OF WARRANTY MANAGEMENT PROCEDURES BY ACTIVITY

1. Activity I

Activity I is supported by a module 2 PWD. After beneficial occupancy of newly completed construction (i.e., the new construction is ready for its intended use), the ROICC sends a form letter to the contractor and PWD in accordance with a ROICC procedures manual published by Western Division Naval Facilities Engineering Command (WESTNAVFACENGCOM).

The letter establishes the warranty start date and provides a copy of outstanding punchlist items requiring contractor resolution. Punchlist items are items of work outstanding or minor discrepancies that the contractor must complete in order to fulfill his contractual obligations. The letter places responsibility for initial contractor notification and resolution of warranty problems on the PWD. The PWD may request ROICC assistance. When the warranty is about to expire the ROICC tries to inspect contract work for defects or problems if its workload permits. Workload usually precludes the warranty inspection.

The ROICC form letter is routed to the PWD Maintenance Control Division (MCD) where it is filed and kept on record. Shops are advised of what is under warranty. The system is informal in nature and there

are no firm established procedures for tracking warranties. The planning and estimating supervisor and MCD director, who have a close day-to-day knowledge of maintenance operations, screen work requests and service calls. They rely on their working knowledge of PWD operations to identify work covered under warranty, and then determine whether to enforce the warranty. They are neither completely familiar with nor have available the contract documents to identify exactly what is under warranty. To enforce warranties, the MCD director first notifies the contractor verbally and requests the problem be corrected. If the contractor does not respond, the ROICC is requested to get involved. Getting contractors to correct warranty deficiencies is viewed as time consuming and difficult.

2. Activity II

Activity II is supported by a module 1 PWD. After final inspection of new construction the ROICC sends a turnover letter to the PWD, noting punchlist items and the date of acceptance from the contractor and requesting acknowledgement of PWD acceptance. As explained in the following paragraph, PWD representatives not only participate in the final inspection but also are involved in monitoring construction as it is put in place by the contractor. The warranty period is noted on the correspondence. The using activity is expected to coordinate directly with the contractor in correcting deficiencies under warranty. As-built drawings (design plans marked to reflect actual construction), shop drawings, and manuals pertaining to construction and installed equipment follow much later.

The PWD tasks two lead planners from the MCD with warranty management. The planners monitor and inspect construction as it progresses to catch

deficiencies and identify possible chronic problem areas. Representatives from the PWD are present for critical tests and activities during construction. They also participate in final inspections and sign off acceptance from the ROICC. The warranty managers attend weekly meetings with the ROICC to keep abreast of construction progress and problems. After construction is turned over to the PWD, they maintain a file of acceptance letters and warranty periods. Work requests are screened for possible warranty coverage. Service calls to the trouble desk are referred to the appropriate lead planner if they are possible warranty items. Shop foremen are given information about warranty periods and the scope of what is under warranty. Warranty calls to contractors are made by the lead planners. However, no call log or formal tickler system is maintained. Day-to-day involvement with construction and maintenance operations keeps the warranty managers up to date on what is in plans and specifications. Hard copies of plans and specifications are not readily available during the warranty period. There is no formal format or procedure used for warranty management.

3. Activity III

Activity III is supported by a module 6 PWD and the same ROICC office as activity II. The same ROICC procedures apply.

Activity III is a small activity and the PWD has no formal procedures for managing construction contract warranties. Construction at the activity is sporadic and generally light. Warranty enforcement is performed by relying on first hand recollection of warranty periods and scope of work. Effort to call in contractors to correct problems is weighed against effort to correct warranty deficiencies using PWD

resources and absorbing the cost before action to enforce warranties is taken.

4. Activity IV

Activity IV is supported by a module 2 PWD. After beneficial occupancy of new construction, the ROICC office sends a form letter to the PWD describing the warranty periods for major items of construction (roofs, equipment, general construction, etc.). Both the contractor and the PWD are notified that the PWD will deal directly with the contractor to correct warranty-related problems. If the PWD has problems with contractor response to warranty work, the ROICC becomes involved. As-built drawings and copies of submittals are forwarded to the PWD several months after beneficial occupancy.

The PWD Facilities Maintenance and Engineering Division (FACMED) director manages construction contract warranties. Shop heads and shop personnel are advised of construction under warranty. Service calls are screened by the shops and, if possibly covered by warranty, are referred to FACMED. FACMED verifies the nature of the problem and decides whether to pursue it under warranty.

FACMED also screens all work requests for warranty work. If work is to be pursued under warranty, the work item is logged in the Base Engineering Support, Technical (BEST) maintenance computer system data base. The contractor is notified verbally and an entry in the division tickler system is made to follow up if there is no response within ten days. If the contractor doesn't respond after two follow-ups, the warranty problem is referred to the ROICC office.

Contractors performing warranty work are required to contact FACMED upon arrival to insure both

parties agree the work is covered by warranty before any work is performed. Once work is completed, ticklers and the warranty data base are updated to reflect completion. A tickler system is also used to schedule an inspection of work under warranty just prior to expiration of the warranty period. If the work to be performed appears to be covered by warranty, a decision is made whether to pursue under warranty or perform the work in-house. If work is done in-house, costs are not recouped from the contractor. No record of warranty work performed in-house is kept. Warranty procedures are documented in a departmental memorandum.

5. Activity V

Activity V is supported by a module 3 PWD. At project completion the ROICC office forwards a memorandum to the PWD MCD citing the beneficial occupancy date and warranty period. Available submittals and other information pertaining to the contract are forwarded at that time. The PWD is responsible for notifying and coordinating contractor work performed under warranty.

The MCD director receives the contract completion package from the ROICC. Any submittals and technical data are turned over to the department engineering division. Work requests are routed through and screened by the Assistant Public Works Officer (APWO), the MCD director, and an MCD assistant prior to estimating and scheduling work. At this time they are screened for warranty work. Service calls are screened by shop foremen and referred to the MCD director if the work is under warranty. The MCD director deals directly with contractors for work performed under warranty. Corporate knowledge of those who screen work requests and service calls is depended upon to identify work that may be accomplished under warranty. The

ROICC is contacted when contractors called in are not responsive. There is no formal system for identifying, managing, or documenting work performed under warranty.

6. Activity VI

Information from Activity VI was not obtained through field investigation but through telephone interview and activity prepared data. Activity VI is classified as a small Public Works Center (PWC). PWC's are generally larger than module 1 PWD's. PWC's differ from PWD's in that they are separate commands whose mission is to provide public works support to customer commands at a given location; in contrast PWD's are a department within a command. PWC's are Navy Industrial Fund activities which are reimbursed by customer commands for support provided. Generally speaking, customer activities for PWC's "own" the facilities and land they use.

Warranty management at Activity VI differs from the other activities studied in that it is performed by a staff in the ROICC office instead of by Public Works. PWC customer activities assign facilities representatives as points of contact with the ROICC and PWC. The facilities representatives are familiar with construction underway or under warranty at their particular activities. If a problem occurs that may be under warranty, the activity representative notifies the ROICC office.

The activity has a strong incentive to identify warranty work because work performed under warranty is done at no cost to the activity. If the PWC is used, then the activity must pay all labor and material costs. Although the same is basically true when a PWD does work, the costs involved are not as obvious. PWD staffing and labor forces are budgeted for an annual level of effort. The cost that a PWD incurs in

performing warranty work in-house is more of a shift in priorities or an increase in the work backlog than it is an increase in the annual budget. Consequently, it is difficult to single out and quantify costs of performing work that might have been done by enforcing warranties. Also, PWD's must weigh the cost of the effort involved in getting contractors to perform under warranty against the cost to simply do the work in-house. Thus, the requirement that PWC customer activities must "pay as they go" provides a stronger incentive for them to enforce warranties whenever possible.

The Activity VI ROICC warranty staff researches customer-generated problems and confirms whether the warranty applies. The staff does all that is necessary to get the problem resolved. This includes notifying the contractor of the warranty problem, proving to the contractor that the problem is covered under warranty, coordinating the repairs, and inspecting and accepting the corrected work. If the problem needs quick resolution, it is corrected by the PWC, and PWC cost information is used to charge the contractor.

The staff is aggressive in pursuing work under warranty. In cases where contractors are not responsive, their bonding companies are notified and/or billed as appropriate. Once warranty work is performed, descriptions, times, dates, and costs are entered in a warranty log. No formal procedures, instructions or policies have been established in managing and enforcing warranties beyond standard correspondence to customer activities when work performed under contract is turned over to the customer.

Data for Activity VI are displayed in Table II separately from data obtained from activities I - V.

Because the site was not visited and because of the differing structures in warranty management, data could not be obtained or presented in the same format as for activities I - V.

E. DESCRIPTION OF DATA OBTAINED FROM SAMPLE PROJECTS

Data were obtained from twelve construction projects completed at activities I through V. These data are described in the following paragraphs and summarized in Table I at the end of the chapter.

1. Project 1

Project 1 is located at activity I. The project consists of three new three-story concrete and masonry structures to be used as enlisted barracks. The construction cost was $8.2 million. Available activity data during the warranty period showed the PWD performed 365 maintenance items at a cost of $19,085. One hundred forty-seven maintenance items were considered questionable, at a cost of $5,015. The estimated maintenance cost during the warranty period as a percent of total construction cost is .23%. The estimated cost of questionable maintenance items as a percent of total construction cost is .06%. Data were available only for the last 8 months of the 12-month warranty period, and are so presented in Table I.

In addition to the maintenance work items, correspondence files in the ROICC office indicate that warranty items involving roof leaks and landscaping problems were referred to the ROICC and eventually corrected by the contractor. Discussion with the Public Works MCD director indicated the contractor was called in for three different types of warranty work. First, problems were encountered with an intercom system which, after the contractor was called in, were found to be a result of tampering by the using activity

and not a contractor responsibility. Subsequent problems with the system were resolved in house. Second, faulty sealing between bathroom shower bases and shower drains were found to be the cause of water leaks in ceilings on the lower floors. The contractor was notified and took action to resolve the problem. No contractor cost data were available. Third, for six months after beneficial occupancy, problems with leaks in individual room hot water heating systems were experienced. The PWD repaired 69 leaks before referring this recurring problem to the contractor. The contractor subsequently resealed piping joints in every individual room heating system to solve the problem. No contractor cost data were available.

2. Project 2

Project 2 is located at activity 1. The project consists of a concrete and masonry building, similar to a motel, used as a temporary lodging facility. The construction cost was $2.3 million. During the warranty period the PWD performed 10 maintenance items at a cost of $950. None of the maintenance items were questionably covered by warranty. Maintenance cost during the warranty period as a percent of total construction cost was .04%. In addition to the maintenance work items, ROICC office correspondence files showed a number of warranty referrals. Problems brought to the contractor's attention involving operation of air conditioning systems, improper voltage for government installed appliances, and landscaping were disputed by the contractor after conducting on-site inspections and are pending resolution. Problems concerning window leaks, plumbing leaks, improperly sloped flooring, and insufficient weather stripping on exterior doors were corrected by the contractor under warranty. No cost

data for contractor performed work or disputed work were available.

3. Project 3

Project 3 is located at activity II. The project entailed replacing existing heating/ventilation air mixing boxes and delivery systems with new ones in an enlisted barracks. The construction cost was $315,000. During the warranty period the PWD performed 17 maintenance items at a cost of $1900. Two maintenance items were questionable, at a cost of $375. Twelve percent of the maintenance items were questionable and 20% of the total maintenance cost was on questionable items. Maintenance cost during the warranty period as a percent of total construction cost is .6%. The cost of questionable maintenance items as a percent of total construction cost is .12%.

In addition to the maintenance work items, the contractor was called in approximately six times to make warranty related adjustments to the system. Chronic problems with the system's ability to supply correct amounts of air flow were identified by the PWD and traced to design deficiencies (not the construction contractor's responsibility). Estimated cost to correct these deficiencies is $50,000.

4. Project 4

Project 4 is located at activity II. The project consists of a new 136,000 square foot industrial building with associated weight handling equipment. The construction cost was $20 million. During the warranty period the PWD performed 99 maintenance items at a cost of $19,150. This dollar value includes 25 items performed by work request, 9 of which had no cost data available. An estimated cost for the 9 items was derived by determining the average cost for the 16 items for which data were available and

applying that average cost to the 9 remaining. This estimated cost was added to the cost of 83 service calls which were performed to arrive at the total maintenance cost of $19,150. Nineteen maintenance items were questionable at a cost of $1,290. Nineteen percent of the maintenance items were questionable and 7% of the maintenance cost during the warranty period was on questionable items. Maintenance cost during the warranty period as a percent of total construction cost is .1%. The cost of questionable items as a percent of total construction cost is .01%. In addition to the maintenance work items, the contractor was called in and performed warranty work approximately 10 times according to the recollection of the warranty manager. Data on the nature of the warranty work or its cost were not available. Government acceptance of weight handling equipment from the contractor was still pending when the data were collected.

5. Project 5

Project 5 is located at activity III. The project consists of a new single story framed and concrete structure over precast piers, used as a fire station. The construction cost was $750,000. During the warranty period the PWD performed 23 maintenance items at a cost of $1446. Three of the maintenance items were questionable, at a cost of $80. Thirteen percent of the maintenance items were questionable and 5% of the maintenance cost was on questionable items. Maintenance cost during the warranty period as a percent of total construction cost is .2%. The cost of questionable maintenance items as a percent of total construction cost is .01%. In addition to the maintenance work items, the activity PWD called the contractor in approximately eight times to correct warranty related problems, according to the maintenance

director's recollection. Problems included malfunctioning automatic roll-up doors, repairs to floor tiling, and cracking wall board adjacent to windows. The contractor corrected all items. No contractor cost data were available.

6. Project 6

Project 6 is located at activity III. The project consists of a new single story masonry building over precast piers, to be used as a warehouse. The construction cost was $390,000. During the warranty period the PWD performed 14 maintenance items at a cost of $930. Six maintenance items were questionable, at a cost of $415. Forty-three percent of the maintenance items were questionable and 45% of the maintenance cost was on questionable items. Maintenance cost during the warranty period as a percent of total construction cost is .24%. The cost of questionable items as a percent of total construction cost is .11%. In addition to the maintenance work items, the contractor was called in for one warranty problem involving moisture protection of the building exterior. Investigation revealed partial design and partial construction deficiencies. The estimated cost to resolve the problem is $6,000. Final resolution of the problem and distribution of responsibility was pending at the time data were collected.

7. Project 7

Project 7 is located at activity IV. The project consists of two new single story concrete masonry structures to be used as administrative facilities. The construction cost was $2.7 million. During the warranty period the PWD performed 86 maintenance items at a cost of $2,700. Twenty-five of the maintenance items were questionable at a cost of $570. Twenty-nine percent of the maintenance items

were questionable and 21% of the maintenance cost was on questionable items. Maintenance cost during the warranty period as a percent of total construction cost is .1%. Questionable maintenance cost as a percent of total construction cost is .02%. In addition to the maintenance work items, the contractor was called in for five warranty problems. Warranty problems included alarm system malfunctions, plumbing problems, and workmanship in tile installation, all of which the contractor corrected. Additional problems were referred to the ROICC and related to cracks in flooring, damage to a deep sink, and pavement problems. Investigation determined the contractor was not at fault for these problems. Cost data on contractor corrected problems were not available.

8. Project 8

Project 8 is located at activity IV. The project consists of two new single story structures. The first structure is a concrete and masonry building used as a munitions magazine. The second structure is a steel framed storage building. The project also includes paving and exterior lighting. The construction cost was $1.5 million. During the warranty period the PWD performed 45 maintenance items at a cost of $2,407. Fourteen of the maintenance items were questionable at a cost of $795. Thirty-one percent of the maintenance items were questionable and 33% of the maintenance cost was on questionable items. Maintenance cost during the warranty period as a percent of total construction cost is .16%. Questionable maintenance cost as a percent of total construction cost is .05%. No warranty related problems were referred to the ROICC. There were no data available concerning warranty problems referred to the contractor by the PWD.

9. Project 9

Project 9 is located at activity IV. The project consists of a single story concrete slab on grade steel frame building, with concrete tilt-up walls and a metal insulated roof deck. The building is used as a training facility. The construction cost was $3.4 million. During the warranty period the PWD performed 134 maintenance items at a cost of $5,541. Fourteen of the maintenance items were questionable at a cost of $526. Ten percent of the maintenance items were questionable and 10% of the maintenance cost was on questionable items. Maintenance cost during the warranty period as a percent of total construction cost is .16%. Questionable maintenance cost as a percent of total construction cost is .02%. During the warranty period the PWD called the contractor in approximately three times to resolve problems with a leaking water recirculating pump. There were also 24 maintenance items concerning problems with a computer controlled heating, ventilation, and air conditioning system. The problems were traced to improper sequencing of the computer controls and determined not to be warranty related. Problems concerning slippery floor tiling and roof leaks were referred to the ROICC and subsequently to the contractor for correction. In addition, design deficiencies with sizing of the air handling system for heating, ventilation and air conditioning were discovered. These were not the fault of the construction contractor. Cost data on contractor corrected problems were not available.

10. Project 10

Project 10 is located at activity IV. The project consists of construction of a new enlisted personnel barracks, extension of and connection to existing utility distribution systems, roadways and

parking lots, and landscaping. The construction cost was $5.2 million. During the warranty period the PWD performed 194 maintenance items at a cost of $6,067. Sixty-two of the maintenance items were questionable at a cost of $1,839. Thirty-two percent of the maintenance items were questionable and 30% of the maintenance cost was on questionable items. Maintenance cost during the warranty period as a percent of total construction cost is .12%. Questionable maintenance cost as a percent of total construction cost is .04%. There were no data available concerning warranty problems referred to the contractor by the PWD. There were six warranty referrals from the ROICC to the contractor. These included lack of alarms on a boiler system, landscaping problems, plumbing problems in various rooms, irrigation system problems, air conditioning operation problems, and various electrical problems. The contractor corrected these problems and, in the case of air conditioning operation problems, provided training to operation and maintenance personnel. Cost data on contractor corrected problems were not available.

11. Project 11

Project 11 is located at activity V. The project consists of a new 3-story reinforced concrete building to be used for administrative and research purposes, constructed at a cost of $6 million. During the warranty period the PWD performed 176 maintenance items at a cost of $6,194. Twenty-six of the maintenance items were questionable at a cost of $706. Fifteen percent of the maintenance items were questionable and 11% of the maintenance cost was on questionable items. Maintenance cost during the warranty period as a percent of total construction cost is .1%. The cost of questionable items as a percent of

total construction cost is .01%. In addition to the maintenance work items performed, three problems were referred to the ROICC. A hydraulic elevator has not operated properly since beneficial occupancy. It was never accepted by the government and the contractor was attempting to correct deficiencies at the time the data were collected. Fire system test discrepancies were referred to the contractor and corrected. Poor ventilation in some rooms was determined to be design related and not a contractor liability.

12. Project 12

Project 12 is located at activity V. The project consists of a prefabricated storage building on a concrete slab, including heating, ventilation, plumbing, and electrical installations. The construction cost was $200,000. During the warranty period the PWD performed 26 maintenance items at a cost of $1,096. None of the maintenance items was questionable. Maintenance cost during the warranty period as a percent of total construction cost is .6%. There were no warranty problems discovered during the warranty period.

F. ACTIVITY VI DATA

As previously discussed, Activity VI warranty procedures differ from those at activities I through V.

Warranty work is documented chronologically in a warranty logbook. Each logbook entry consists of the date the warranty complaint was received, the identification number of the facility involved, a brief description of the problem, the date the warranty problem was corrected, and the cost of the warranty work performed.

In 1985, 274 construction problems were corrected under warranty at a cost of $91,300. Six of the

problems corrected under warranty were obvious and/or relatively expensive to correct, ranging in dollar value from $3,025 to $18,000. The value of construction under warranty is estimated at $20 million.

In 1986, 174 construction problems were corrected under warranty at a cost of $192,500. Fifteen of the problems corrected under warranty were obvious and/or relatively expensive to correct, ranging in dollar value from $1,350 to $60,000. The value of construction under warranty is estimated at $21.1 million.

Activity VI warranty data are displayed in Table II at the end of the chapter.

G. POST OCCUPANCY EVALUATION (POE)

As discussed in chapter II, the NAVFAC Post Occupancy Evaluation program evaluates the adequacy of recently constructed facilities from a number of aspects, identifies problem areas, and recommends solutions. The evaluation is conducted after the facility has been completed and occupied by the user but prior to expiration of the construction warranty. Results of twelve POE's were examined with respect to deficiencies recommended for resolution under warranty.

The twelve projects selected were located at nine different activities under the jurisdiction of five different Engineering Field Divisions. For the twelve projects a total of 526 deficiencies were discovered, 112 of them or 21% were recommended for correction under warranty. Of the 112 deficiencies recommended for correction under warranty, 44 or 39% were of such a nature that they did not pose an immediate problem, but could and probably eventually would develop into a problem after the warranty period expired.

H. SUMMARY

This chapter has presented data pertaining to construction contract warranty management from three sources: (1) Studies conducted at field activities, (2) Records from an additional field activity, and (3) Samples of NAVFAC Post Occupancy Evaluations. The data form the basis for analyzing general field practices with respect to warranty management and identifying strengths and weaknesses in the next chapter.

TABLE I

PROJECT DATA SUMMARY

	PROJECT					
	1*	2	3	4	5	6
ACTIVITY	I	I	II	II	III	III
MODULE	2	2	1	1	6	6
ITEMS						
TOTAL MAINTENANCE ITEMS	365	10	17	99	23	14
TOTAL MAINTENANCE ITEMS QUESTIONABLE	147	0	2	19	3	6
% TOTAL MAINTENANCE ITEMS QUESTIONABLE	39%	0%	12%	19%	13%	43%
COSTS						
MAINTENANCE COST ($K)	$19.1	$.95	$1.9	$19.1	$1.4	$.93
COST OF QUESTIONABLE ITEMS ($K)	$5.0	$0	$.38	$1.3	$.08	$.42
% TOTAL MAINTENANCE COST QUESTIONABLE	26%	0%	20%	7%	5%	45%
% MAINTENANCE COST OF CONSTRUCTION COST	.23%	.04%	.6%	.1%	.2%	.24%
% QUESTIONABLE COST OF CONSTRUCTION COST	.06%	0%	.12%	.01%	.01%	.11%
WARRANTY REFERRALS	5	7	6	10	8	1

*Data are based on last 8 months of warranty period only.

TABLE I

PROJECT DATA SUMMARY

(continued)

	PROJECT					
	7	8	9	10	11	12
ACTIVITY	IV	IV	IV	IV	V	V
MODULE	2	2	2	2	3	3
ITEMS						
TOTAL MAINTENANCE ITEMS	86	45	134	194	176	26
TOTAL MAINTENANCE ITEMS QUESTIONABLE	25	14	14	62	15	0
% TOTAL MAINTENANCE ITEMS QUESTIONABLE	29%	31%	10%	32%	15%	0%
COSTS						
MAINTENANCE COST (#K)	$2.7	$2.4	$5.5	$6.0	$6.2	$1.1
COST OF QUESTIONABLE ITEMS (#K)	$.57	$.8	$.5	$1.8	$.71	$0
% TOTAL MAINTENANCE COST QUESTIONABLE	21%	33%	10%	30%	11%	0%
% MAINTENANCE COST OF CONSTRUCTION COST	.1%	.16%	.16%	.12%	.1%	.6%
% QUESTIONABLE COST OF CONSTRUCTION COST	.02%	.05%	.02%	.04%	.01%	0%
WARRANTY REFERRALS	5	0	5	6	3	0

TABLE II
ACTIVITY VI WARRANTY DATA

YEAR	1984/1985	1985/1986
COST OF WORK IN PLACE $K	20,000	21,100
ITEMS PERFORMED UNDER WARRANTY	274	174
DOLLAR VALUE OF WARRANTY ITEMS ($K)	$91.3	$192.5
DOLLAR VALUE / WIP	.46%	.91%
# HIGH COST ITEMS PERFORMED UNDER WARRANTY	6	15
% OF TOTAL ITEMS	2%	9%
DOLLAR VALUE ($K)	$45.8	$154.5
% OF TOTAL DOLLAR VALUE	50%	80%
# REMAINING ITEMS PERFORMED UNDER WARRANTY	268	159
% OF TOTAL ITEMS	98%	91%
DOLLAR VALUE ($K)	$45.5	$38
% OF TOTAL DOLLAR VALUE	50%	20%

IV. ANALYSIS

A. APPROACH

This chapter is divided into two sections. The first section analyzes the policies and procedures which govern NAVFAC contracting and facilities management and their application to important factors in construction contract warranty management. The second section analyzes the data obtained during the field investigations.

B. ANALYSIS OF POLICY AND PROCEDURES

This section examines the various policies, criteria, and guidance that affect the use and management of warranties in NAVFAC construction contracts. Analysis is conducted by dividing the warranty management process into the contractual and the maintenance and enforcement phases. Important areas of concern for the proper management and enforcement of construction contract warranties are described and then examined with respect to the policies, criteria, and guidance NAVFAC uses to manage them. Through this process, shortcomings and gaps in the warranty management process are identified and discussed by drawing from data collected in field investigations.

1. Key Warranty Objectives in Construction Contracting

Many factors must be considered when work installed by construction contracts is to be placed under warranty. These factors can be segregated into contracting related factors, which come under the cognizance of the Contracting Officer and the ROICC, and operation and maintenance factors, which come under the cognizance of the Public Works Department.

a. Warranty Factors in Contracting

Warranty factors that must be considered in developing contract specifications and during contract administration include the following:

1. A policy concerning the use and enforcement of warranties must be established.
2. A decision must be made whether to use standard industry warranties or develop specialized warranties on a case-by-case basis.
3. A decision must be made as to what shall be put under warranty and what the warranty period shall be.
4. Warranty provisions must be developed and incorporated into the contract in such a manner that they are clearly understood by the contract administrators and the contractor.
5. The warranty period must be specified in the contract.
6. Rights and obligations of the government and the contractor must be included in the warranty provisions.
7. Proper installation and operation of materials and equipment installed under the contract must be verified prior to acceptance from the contractor.
8. As-built conditions must be confirmed and documented at the time of acceptance of construction from the contractor.
9. Operation, maintenance and warranty data must be obtained for materials and equipment under warranty and transmitted to operation and maintenance personnel.
10. Lines of communication and procedures for contractor notification of warranty problems must be established.
11. The government must have some kind of leverage it can use to insure the contractor honors the warranty provisions of the contract or a method whereby costs to correct warranty deficiencies can be recovered from the contractor.

b. Warranty Factors in Operation and Maintenance

Factors that must be considered in the management of construction contract warranties by PWD's include these:

1. There must be a procedure for accepting newly completed construction from the ROICC.
2. The provisions of the warranty must be known.

3. The PWD must be aware of proper operation and maintenance procedures to preclude inadvertent voiding of the warranty.

4. The PWD must know what is under warranty.

5. The warranty period must be known.

6. The PWD must have a procedure and point of contact for referring warranty problems to the contractor or the ROICC.

7. The PWD must have a network to identify work requirements.

8. The PWD must have a way to screen work requirements to identify those that might be covered by warranty and have controls in place to insure work requirements actually do get screened for possible warranty application.

9. The PWD must have a way to document and track warranty problems.

10. There must be a decision making entity that can determine whether a work requirement is covered by warranty and if it should be pursued under the warranty provisions of the contract or should be performed in house and the cost absorbed.

2. Examination of NAVFAC Procedures with Respect to Warranty Factors in Contracting

a. A policy concerning the use and enforcement of warranties must be established.

NAVFAC has developed and issued clear, simple policy on the use of warranties in construction contracting. The NAVFAC P-68 policy that warranties be limited to those described by the standard contract forms is followed in the vast majority of contracts. The wording for NAVFAC's standard warranty clause (Clause 60) is identical to that recommended by the FAR. (See Appendix A.) Deviations occur only when such deviations are in line with standard industry practices. This clear-cut policy has resulted in use of contract clauses consistent with the policy and a single standard warranty for almost all contracts. By sticking to the same standard clause for the thousands of construction contracts issued annually, management and enforcement of construction contract warranties has been simplified. Activities that manage warranties can

develop procedures that they know will be applicable to all construction contracts under their cognizance.

NAVFAC policy that the using facility be the primary enforcer of warranties is also made clear in the P-68. However, the P-68 is a contracting manual, not a public works management manual; consequently, it does not offer any further policy or guidance on how warranties should be managed. The primary manuals and instructions used to guide and evaluate public works management do not address warranty management.

Also, individuals responsible for maintenance management and warranty enforcement in PWD's do not deal with contracting manuals and the FAR in day-to-day operations; consequently, they usually are not thoroughly familiar with their contents. As a result individual activities are left to develop their own warranty management programs or simply "muddle through" warranty enforcement. The lack of explicit warranty enforcement policy increases the risk of individual activities overlooking some of the rights and responsibilities they have in managing construction contract warranties.

b. A decision must be made whether to use standard industry warranties or develop individual warranties.

As stated in the P-68 Contracting Manual, NAVFAC has determined through experience that special warranty provisions increase contract costs while failing to enhance the government's ability to obtain corrective action. NAVFAC has decided to utilize Clause 60 and adopt industry standards that differ from the warranty clause when it may be done at no additional cost [Ref. 6:para. 4-218]. This policy enhances consistency and helps to simplify contracting procedures.

c. A decision must be made as to what shall be under warranty and what the warranty period shall be.

NAVFAC has addressed this factor with clarity and consistency through the use of Clause 60 and the standard warranty period of one year.

d. Warranty provisions must be developed and incorporated into the contract in such a manner that it is clearly understood by the contract administrators and the contractor.

Clause 60 provides a general description and communicates the gist of the government's and the contractor's rights and obligations. The technical sections of contract specifications are also used to communicate specific warranty requirements in certain cases. For instance, built-up asphalt roofing specifications adopt a five year standard industry warranty and prescribe weather proof information cards containing warranty data that must be posted in specific locations. However, precisely what warranty data are to be communicated from the contractor to the ROICC, and how, are often left vague in the contract documents or not addressed at all. For instance, the WESTNAVFAC additional warranty clause "Equipment Warranty Identification" states:

> Each item of equipment provided by this contract which is warranted by a subcontractor, manufacturer or supplier shall be identified by a suitable information tag. Tag information shall include contract name and number, contractor's name and address, warranty period, telephone number and address of warranty contact. Tags shall be self-adhering, adhesive-backed labels or heavy duty paper attached by nylon self-locking fastener. [Ref. 16]

However it is left unclear precisely what equipment will receive tags (fans, motors, light fixtures, plumbing fixtures, door hardware, etc.); and no way to confirm which equipment is warranted by subcontractors, manufacturers, or suppliers is indicated.

e. The warranty duration must be specified in the contract.

This need is fulfilled through standard contracting procedures and Clause 60. ROICC procedures manuals such as the WESTNAVFAC ROICC manual include standard form letters to be sent to concerned parties in various situations that routinely occur during the life of a construction contract. Included are standard letters of acceptance, that notify the contractor that the government has accepted the construction for use and advise the PWD or user that they have assumed responsibility for the construction. The acceptance date and the warranty period are specified so both the contractor and the user are aware.

f. Rights and obligations of the government and the contractor must be included in the warranty provisions.

Clause 60 clearly describes the rights and obligations of the contractor and the government concerning warranties. Contractors and the ROICC personnel are familiar with these responsibilities.

g. Proper installation and operation of materials and equipment installed under the contract must be verified prior to acceptance from the contractor.

Procedures and requirements of the NAVFAC P-68 and the WESTNAVFAC ROICC manual insure this factor is satisfied. Formal final inspections are conducted with input from the contractor, the ROICC, and the user. Discrepancies in construction are documented and corrected by the contractor prior to final payment.

h. As-built conditions must be confirmed and documented at the time of acceptance.

As-built drawings are contract requirements of the Additional General Paragraphs of NAVFAC construction contracts. Contractors are required to maintain at the job site copies of contract drawings annotated to show all deviations from the original design. Partial payments for work completed are not

approved if the as-built drawings are not up to date and final payment is not made until as-built drawings are submitted to the ROICC. Thus, there is plenty of incentive for the contractor to comply with this requirement. However, there are often problems in transferring as-built drawings into the hands of those who manage construction warranties for PWD's. Most sites visited often did not receive as-built drawings until well into the warranty period. This delay makes it difficult to confirm whether problems were covered under warranty or not. Also, as-built drawings may be maintained by another division within the PWD; consequently, those managing the warranties feel they do not have ready access to them. This is a problem in particular with projects involving renovation, repair, or additions to existing facilities where it is not clear as to what was installed by the contractor and what was in place prior to contract award.

i. Operation, maintenance and warranty data must be obtained for materials and equipment under warranty and transmitted to operation and maintenance personnel.

For those responsible for operation and maintenance of equipment installed under construction contracts to insure they meet manufacturer's requirements to keep warranties valid, they must have access to manufacturer's maintenance and operation data. Construction contracts require this information from the contractor as part of the approval process before the contractor is permitted to install equipment. Toward the end of the contract, the ROICC assembles this information and forwards it to the PWD. However, this step in the turnover process generally takes a relatively low priority since the ROICC must also get the project completed so the user can occupy the facility, correct construction deficiencies before final inspection, and fulfill other administrative

requirements in order to get the contractor paid and the contract closed out. Often this problem is complicated by user occupancy of portions of new construction well before final acceptance. As a result, control over manufacturers' operation and maintenance data can be lost; thus the data may not get to those who need them when they need them.

j. Lines of communication and procedures for contractor notification of warranty problems must be established.

Lines of communication and notification procedures are necessary to insure that action is taken to advise the appropriate contractor representatives of warranty deficiencies. NAVFAC policy clearly states that the using activity is responsible for notifying the contractor of warranty deficiencies. During the process of accepting facilities from the contractor and turning them over to the using activity the ROICC, as a matter of routine, advises the using activity in writing of a contractor point of contact for warranty problems by means of a locally developed standard format. (See Appendix E.) Likewise, the ROICC notifies the contractor that the using activity will contact the contractor directly on matters concerning warranty problems. (See Appendix F.) At the activities studied, however, there was no specific guidance describing procedures and documentation that the PWD warranty manager should use when warranty problems arise and the contractor must be contacted.

k. The government must have some kind of leverage it can use to insure the contractor honors the warranty provisions of the contract or a method whereby costs to correct warranty deficiencies can be recovered from the contractor.

The government has various types of leverage it can use to enforce warranties. First, Clause 60 is specific about the government's rights if a contractor is not responsive to warranty calls. The

government has the right to replace or repair defective work at the contractor's expense. As previously discussed, however, this option often is not taken, as those managing warranties either are not familiar with Clause 60 or feel the benefits of pursuing the government's rights under it do not outweigh the costs. Second, the government conducts performance evaluations on construction contractors, as was discussed in Chapter II. The evaluations, however, are conducted at the time the contract is completed, well before the warranty period expires. There is no provision for PWD input on warranty performance or evaluation at the end of the warranty period. Third, for contracts with a dollar value over $25,000 contractors must obtain a performance bond for the contract amount. Contractors must maintain a positive image in the eyes of their bonding agents or their ability to obtain reasonable bonding rates will be jeopardized. Notification of contractor bonding agents of poor response to warranty problems can spur response from contractors.

3. Examination of NAVFAC Procedures with Respect to Warranty Factors in Operation and Maintenance

a. There must be a procedure for accepting newly completed construction from the ROICC.

EFD guidance, such as that found in ROICC manuals lists steps for the ROICC to take when accepting construction from the contractor and turning it over to the using activity. The contract close-out checklist (see Appendix D) contains detailed, systematic steps for turning facilities over to the user. However, at the activities studied, PWD's did not use the same or a similar checklist to plan for the various stages of acceptance or insure that all the proper steps are followed. Without such procedures,

acceptance of facilities, manuals, documents, and spare parts is susceptible to being performed in a disorderly manner.

b. The provisions of the warranty must be known.

Personnel in the PWD who are responsible for warranty management usually are not completely familiar with the provisions of Clause 60. For instance, Clause 60 states:

> The Contracting Officer shall notify the Contractor, in writing, within a reasonable time after the discovery of any failure, defect, or damage.
>
> If the Contractor fails to remedy any failure, defect, or damage within a reasonable time after receipt of notice, the Government shall have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the Contractor's expense. [ref 3:para. 52.246-21]

Although ROICC acceptance letters usually designate the PWD as the originator of warranty referrals to the contractor, PWD's when notifying contractors of warranty problems did so verbally at each activity visited. Written correspondence was not used unless the contractor was unresponsive and the ROICC was requested to intervene. Most warranty managers at PWD's felt they had no recourse if a contractor was non-responsive. However, in accordance with Clause 60 they have the right to correct warranty problems by other means and back-charge the contractor. The various directives, manuals, and instructions that maintenance managers use in day-to-day operations do not address warranty management or the options available in enforcing warranties.

c. The PWD must be aware of proper operation and maintenance procedures to preclude inadvertent voiding of the warranty.

The technical provisions of construction contracts generally provide for manufacturer representatives and/or installation personnel to familiarize PWD personnel in the operation and

maintenance of complex or critical equipment. PWD's have key operators and maintenance personnel obtain such familiarization. Contractors are also required to submit maintenance and operation manuals and descriptive literature to the ROICC office, which then turns them over to the PWD. However, as discussed in paragraph 2.i preceding, this information is not always turned over in a timely and orderly fashion. As a result, key operators and maintenance personnel may not have ready access to detailed maintenance and operation information when they need it.

d. The PWD must know what is under warranty.

As previously discussed, the turnover process of construction from the contractor to the ROICC to the PWD insures the PWD inspects new construction before accepting it and has a good general idea of what the contract provides. However, as also discussed, as-built drawings and manufacturer's data on operation and maintenance often are not readily available to the managers responsible for warranty management. The various directives, manuals, publications, and instructions concerning maintenance management of facilities do not address standard procedures for identifying exactly what is under warranty and confirming proper maintenance and operation procedures. As a result, individual activities must develop their own procedures, if they do so at all.

At each of the activities visited PWD personnel involved in warranty management felt they often had to consult with the ROICC to determine the applicability of warranty provisions before dealing with contractors. Because of heavy workloads at the ROICC office, its response to the PWD often was not considered timely. This reinforced the PWD manager's

belief that it was simpler to correct warranty problems in-house and absorb the costs. On the other hand, in some instances the contractor was called in for what was believed to be warranty work, performed the work, and then billed the government for his efforts because the work in actuality was not covered by warranty. In addition, no guidance exists for communicating warranty information within PWD's to insure all personnel who need to be familiar with warranty provisions and periods are so informed.

e. The warranty period must be known.

Standard turnover procedures and correspondence insure the warranty period is clearly communicated from the ROICC to the PWD. As stated above, however, there is no guidance for communicating warranty information within PWD's to insure all personnel who need to be familiar with warranty provisions and periods are so informed.

f. The PWD must have a procedure and point of contact for referring warranty problems to the contractor or the ROICC.

The guidance used by PWD's in day-to-day facilities maintenance management does not recommend or address procedures for referring warranty problems to the contractor or ROICC. Construction turnover letters from the ROICC to the PWD provide a contractor point of contact for warranty problems. However, as previously discussed, the rights and responsibilities of the government described in Clause 60 are not communicated to the PWD warranty manager. As a result, the clause requirements are not always followed. PWD's usually take a common-sense approach to contacting the contractor, but no procedures on how to pursue or document warranty problems are formalized.

g. The PWD must have an organizational network to identify work requirements.

The NAVFAC MO-321 and the P-318 provide explicit guidance on how PWD's should be organized and work requirements identified and scheduled for completion. PWD's comply with this guidance and, as a result, have a tried and proven system for identifying work requirements.

h. The PWD must have a way to screen work requirements to identify those that might be covered by warranty and have controls in place to insure work requirements actually do get screened for possible warranty application.

The MO-321 and the P-318 provide the guidance needed to effectively screen work requirements in order to set priorities, classify the work, or make decisions on how it is to be completed. However, specific identification of warranty related problems and warranty enforcement are not discussed. As a result there is no guidance for setting up controls for the work management branch to insure possible warranty work does get identified.

Individual PWD's approach warranty identification as they see fit. Subsequently, procedures for screening and classifying work requirements are consistent from activity to activity, but the extent of screening for and identification of warranty work varies greatly. Generally, the activity warranty manager is fairly senior (a FMED/Maintenance Control Division Director or a senior planner) in the organization and is unable to review each and every work requirement. Procedures, if any, for screening by work receptionists or shop supervisors in the Maintenance Division to identify work requirements covered by warranty are informal at best. The various scheduled preventive maintenance inspection procedures and reports specified by the NAVFAC MO-322 make no

reference to classifying possible warranty work as such. This situation creates a potential for warranty-related problems to slip through the work control system undetected, particularly at larger activities where the warranty manager is unable to screen each work requirement on his own. This problem was discovered to have impacted some projects studied, where a large number of relatively small but almost identical warranty related problems were handled as normal work requirements and contractor resolution was not pursued. Although the individual cost of the work was small, its cumulative effect could be potentially high.

i. The PWD must have a way to document and track warranty problems.

The manuals, directives, publications, and instructions used as primary guidance for PWD maintenance management do not address tracking warranty problems. As a result the methods and degree of tracking vary from activity to activity. In most cases warranty related problems are not tracked. Generally speaking, if a warranty problem is discovered and a decision made to have the contractor remedy the situation, the contractor is usually verbally notified but no record of the call is made or follow-up correspondence is sent. However, if a construction problem arises that has very high potential costs to correct or severely impacts operations, correspondence is generated by the PWD to the ROICC, requesting ROICC assistance. These instances are handled on a case-by-case basis and not according to any pre-established procedures.

j. There must be a decision making entity that can determine whether a work requirement is covered by warranty and if it should be pursued under the warranty provisions of the contract or should be performed in house and the cost adsorbed.

The NAVFAC MO-321 and the NAVFAC P-318 provide for the required decision making entity to exist. PWD's comply with the requirements set forth by these documents. In most cases the FMED/Maintenance Control Division Director assumes this responsibility and decides whether to pursue contractor correction of warranty problems or to perform the work in house. In the activities visited, no effort was made to seek reimbursement from the contractor for warranty work performed in house. Also, as previously discussed, although the entity exists, there is no formal guidance that describes how the PWD will insure the decision making entity is to be made aware of warranty problems or advise it of all the options available in making the decision whether to enforce a warranty or not.

C. ANALYSIS OF FIELD DATA

This section examines the warranty management data collected from field activities. Analysis is conducted in three sections. First, general field practices with respect to warranty management are discussed. Second, strengths and weaknesses of general field practices are noted. Third, the effects of the general way in which NAVFAC activities manage construction contract warranties are discussed.

1. Field Practices

The four activities visited during field investigation take the same basic approach to warranty management. As the size of the activity and construction workload increase, warranty management receives more emphasis.

Primary warranty management responsibility is assigned to a fairly senior manager in the PWD maintenance control function -- the Maintenance Control Director, Facilities Maintenance Engineering Division Director, or a senior member of the Planning and Estimating branch. There are no formal written descriptions of warranty management responsibilities or established procedures to follow to identify and handle warranty problems.

Warranty managers rely heavily on their day-to-day working knowledge of PWD operations to determine whether a work requirement should be considered a warranty problem. Heavy dependence is also placed upon the corporate knowledge of key personnel in the maintenance branch to recognize work requirements as possibly being covered under warranty. No formal procedures are used to advise maintenance division or work receptionists of the scope or duration of the various warranties in affect at any given time. Work receptionists are not briefed or given warranty information to assist them in screening work requirements. Few if any formal controls or documents are used aside from files of turnover letters and correspondence with the local ROICC. Warranty managers tend not to have ready access to nor rely heavily upon contract files, as-built drawings, contract specifications, or technical manuals provided by the construction contract.

There is a tendency to resolve warranty problems by using activity resources and absorbing the cost. The effort required to have contractors correct warranty problems is considered to outweigh the cost of doing the work in house in most cases.

When a major or costly warranty problem arises, the warranty manager tends to recognize it as such and

takes appropriate, if not standardized, action to refer it to the ROICC and get it resolved before expending local resources other than those necessary to determine the scope of the problem and correct unsafe conditions. No effort is made to recoup such investigative and shut-down costs from the contractor.

Warranty referrals to contractors are verbal. Official correspondence is usually used only when the activity seeks ROICC assistance in resolving warranty related problems. With the exception of one activity, warranty managers do not keep records of warranty actions taken.

No formal inspections are scheduled toward the end of warranty periods for the purpose of identifying construction problems that have not yet become evident and referring them to the contractor for correction.

2. Strengths and Weaknesses of General Field Practices

a. Strengths

There are some advantages to taking the approach to managing construction contracts found at the five activities visited. Since warranty management is essentially a collateral duty, closely associated with the warranty manager's primary duty, the organization does not require or have to pay for additional resources in order to manage warranties. The managers are not tied to paperwork or fixed procedures; so, they can operate freely and efficiently, as long as they have sufficient knowledge of the status of facilities and contracts. This common-sense approach allows the warranty manager to give matters his attention on a case-by-case basis as the particular problem merits. Problems that are serious and possibly costly receive a lot of time and attention. Insignificant problems do not. This gives

the manager flexibility in how to approach warranty management and how to react to various situations. Such an approach places a lot of dependence on the warranty manager's judgement and corporate knowledge. This dependence on the warranty manager can serve as a motivating factor in his overall performance and job satisfaction.

b. Weaknesses

Offsetting the advantages of the typical approach to managing construction contract warranties are several disadvantages that could result in serious maintenance problems or unnecessary costs to the PWD.

The informal approach results in a lack of documentation or paper trail to rely upon in the event attempts are made to have a contractor correct a problem and he is non-responsive. The effectiveness of action that can be taken against a contractor is reduced significantly when the government cannot prove he has been non-responsive.

The lack of systematic screening for warranty problems among work requirements increases the likelihood that the PWD will continually fix small and seemingly insignificant warranty problems that are chronic in nature. The cumulative cost of a large number of small repairs can become large, and important lessons that might be learned for future projects can be lost.

There is always the chance a large problem will not be identified as covered by warranty. Misunderstanding of the warranty period or misjudgments in what was thought to be under warranty can result in the PWD correcting a costly problem that should have been covered by warranty. Also, the warranty manager normally will not screen every single work requirement

and thus may miss work requirements covered by warranty.

When contractors are not held responsible for substandard materials or workmanship, they have no incentive to improve or may not even be aware their work is substandard. As a result, overall quality of construction at the activity may suffer.

Without an organized warranty management system it is nearly impossible to assign responsibility or accountability to specific personnel or positions that provide the warranty manager with key information concerning warranty problems. When breakdowns in communication do occur, it is difficult to determine how, why, or even if they occurred. Each activity is basically on its own when setting up and running a program for warranty management. The overall knowledge and experience throughout NAVFAC is not taken advantage of because it is not consolidated anywhere. This study, which was limited to a handful of activities, observed many good practices. However, they were not universal. They were scattered among the various activities.

With no system for warranty management in effect, warranty enforcement can easily take a back seat to other priorities. If the primary warranty manager vacates his position, his knowledge is lost and the system must be regenerated from scratch, if it is regenerated at all. This heavy reliance on one individual is not healthy.

3. Analysis of Data Collected

NAVFAC warranty management as it occurs in the field can be summarized as follows: Individual activities develop their own procedures by taking a common-sense approach. Procedures are informal and intuitive in nature. Personnel are often designated as

responsible for warranty management, but formal programs are not developed. Warranty managers are concerned primarily with warranty problems that have a major impact on the facility in question or will result in high repair costs. Problems of this nature are referred to the contractor via the ROICC. Small problems that may be warranty-related are generally resolved by using PWD resources. It is considered more cost effective to solve the problem and absorb the cost than to pursue contractor resolution under the contract warranty clause. If contractor response is possible with minimal effort, such as a telephone call, the warranty clause will be enforced. Little if any effort is expended to recoup costs of warranty work performed by government forces.

Although these procedures result in the shortcomings and potential problems discussed in the preceding section, no major negative effects were discovered from analyzing the research data. At the activities visited, the cost of possible warranty work items as a percent of construction generally ranged between .01% and .05% or $100 to $500 for every $1,000,000 of construction.

Of the 318 maintenance items performed by PWD's and considered to be questionably covered under warranty, the labor expended to correct the problem was less than two hours in approximately 240 of the cases or 77% of the time. If the effort to pursue contractor correction of possible warranty-related problems (including investigation of the problem, contractor notification, documented follow up, familiarization of the contractor with the problem at the site, and inspection of the corrected work) costs the same as or more than two hours of skilled labor, the net cost of

possible warranty work items as a percent of construction cost becomes even smaller.

Warranty managers tended to be aware of and had taken appropriate action to enforce warranties for major defects in construction. Of the 12 projects studied, six cases of major warranty problems were discovered to have been referred to the ROICC and contractor. Of all the questionable work items performed by the PWD's, no individual item was of a major scope or cost. On the other hand, however, for two projects, numerous chronic and similar small problems which had potentially high cumulative costs were resolved at government expense before the warranty was enforced.

In contrast to the PWD's studied, at activity VI, a PWC, the ROICC uses a full time staff to pursue warranty work. During the first six months of 1986, a staff of three (one GS11 and two GS9) resolved warranty problems. During the last six months of 1986, this staff was increased to five (one GS11, two GS9, one GS7, and one WG9). The estimated staffing cost during 1986 (unaccelerated personnel costs only) is $105,000. During 1986, 174 warranty problems were resolved, with an estimated value of $192,543. Thus, the warranty staff's enforcement efforts saved a net total of approximately $87,500 (less labor acceleration costs) in 1986. Of the 174 warranty problems solved during 1986, 15 were resolved at high costs to the contractor, a total of $154,510. Thus, approximately 9% of the warranty-related problems accounted for approximately 80% of the recovered warranty costs. Had the warranty staff concentrated solely on these high cost problems, a net savings of $49,510 (less labor acceleration costs) would still have been realized.

Generally speaking, the administrative time and effort required to investigate and resolve warranty problems is proportionate to the labor and material cost to resolve them. High cost warranty problems require high administrative effort; low cost problems, less administrative effort. Thus, if the staff were to concentrate solely on high cost warranty problems, it would most likely still require approximately 80% of its personnel. Since high cost warranty problems do not necessarily occur at a uniform rate, a policy of resolving minor problems as well as the major ones appears to be prudent strategy. It provides steady workload during gaps between major problems and maintains the capability to handle the major problems as they occur. This seems to be the case at activity VI, as the warranty enforcement workload is generally heavier that what the staff can keep up with. [Ref. 17]

In addition to the cost savings there are other benefits realized from use of the warranty staff. Overall quality in construction may improve as local contractors and subcontractors become aware that warranties are strictly enforced. Discovery and reporting of warranty deficiencies may increase as awareness of warranty enforcement is raised. Finally, the effectiveness of warranty efforts may continuously improve as the dedicated staff becomes more experienced in strategies to pursue in discovering deficiencies covered by warranty and in enforcing warranties.

This is not to suggest that PWD's and ROICC's at all activities should develop similar arrangements as at activity VI. Before such an arrangement is used, careful analysis of construction workload and staffing requirements would be required on a case-by-case basis. What the activity VI data does show, however, is that a very small percentage of warranty problems make up a

large percentage of the total cost of all warranty problems. If an activity can identify all of the major problems and turn them over to the contractor to resolve without an elaborate warranty management organization, cost effectiveness can be realized. The key, however, is to identify the large problems and have the contractors correct them. The field study suggests that this is what typically happens in practice now. Small activities tend to have very informal controls concerning warranty management. As the size of the activity increases, the controls become more structured and more management time and resources are devoted to warranty enforcement. At the largest activities PWD personnel are specifically assigned to construction contract coordination and warranty management.

Such a progression makes sense. At the small activities a handful of people have a thorough corporate knowledge of PWD operations, and construction occurs only occasionally and is relatively easy to keep track of. As the size of the activity increases, so does construction and the PWD activity. Knowledge required to keep track of warranties becomes more than one person can handle informally or on a part-time basis, and the need for control and organization increases. Finally, at activities such as PWC's or Module 1 PWD's the construction workload is consistently at a high volume and requires more attention and staffing in order to identify, track, and resolve warranty problems.

4. Post Occupancy Evaluation

The data collected from twelve sample post occupancy evaluations indicate that warranty type problems are not always obvious or reported when they occur. Substandard workmanship and/or materials can

cause accelerated wear and deterioration of equipment and materials. However, this wear may not develop into a breakdown or failure until after the warranty period has expired. Therefore, prior to the end of the warranty period, inspections should be conducted to identify such deficiencies that have not yet become obvious.

The NAVFAC MO-322 [Ref. 12], Inspection of Shore Facilities, provides for annual facility condition inspections and specifies inspection and reporting procedures. However, the various checklists and forms used direct and document the inspections do not provide a means to earmark deficiencies that may be correctable under warranty. Nor does the manual specifically address new facilities and the need to conduct the first annual inspection prior to the end of the warranty period, with warranty deficiencies in mind. This omission creates a potential for hidden warranty deficiencies not to be identified or to be identified only after the warranty has expired.

D. SUMMARY

The information and data presented in Chapters II and III have been analyzed in this chapter with respect to key warranty factors in contract development and administration as well as key warranty factors in operation and maintenance of facilities. Strengths and weaknesses in the methods the NAVFAC organization uses to manage construction contract warranties have been presented and discussed. The analysis conducted in this chapter forms the basis for the recommendations provided in Chapter V.

V. SUMMARY AND RECOMMENDATIONS

A. APPROACH

This chapter is divided into two sections. The first summarizes and comments on the findings developed in Chapter IV. The second section recommends actions that could be taken to improve overall management of NAVFAC construction contract warranties.

B. SUMMARY OF FINDINGS

1. Summary of NAVFAC Procedures with Respect to Warranty Factors in Contracting

NAVFAC has established and clearly communicated its warranty policies within the organization. Standard contract language concerning warranties is to be used in lieu of special warranty provisions. NAVFAC's policies are in agreement with FAR and DFAR guidance, and the various field activities comply with those policies. Warranty clauses found in construction contracts are in line with NAVFAC policy. The result is a standard contract warranty clause that is used throughout NAVFAC, almost without exception. When exceptions to the standard clause do occur, they are made to comply with an industry standard.

The standard contract clause, Clause 60, which addresses construction contract warranties clearly describes the rights and obligations of the Government and the contractor. Contract specifications regarding warranties are consistent from contract to contract so procedures for warranty management and enforcement can be standardized. Contract specifications provide authority for the ROICC to enforce the contractor's obligation to turn over descriptive literature, as-

built drawings, and warranty information to the Government. Thus, a solid core of information is available for use in managing warranties for individual facilities.

ROICC offices, to a large extent, use standardized procedures in managing construction contracts. Checklists and standard formats for routine administrative actions are used. Standard formats concerning construction contract warranties address obtaining warranty information from contractors; turning operation, maintenance, and warranty information over to the using activity; facility acceptance from the contractor and turnover to the using activity; and contractor notification of warranty-related deficiencies. These formats are generated by the EFD; so, the same procedures are used over a wide geographic area. This uniformity benefits both contractors and contract administrators, since they have to be knowledgeable about only one system.

At the completion of contracts, acceptance inspections are conducted, contractor training of operation and maintenance personnel is performed, deficiency lists for contractor resolution developed, warranty start dates established, and transfer of facility custody from the contractor to the PWD is accomplished. The procedures used by the ROICC, although standardized, are general in nature. Specific action should be taken by the ROICC and the PWD to insure the transfer of information is conducted in a precise, orderly, well planned manner. In practice, however, the transfer of information may not be timely and the PWD may not have a procedure for acceptance and internal distribution of the information. As a result, important warranty information is susceptible to being misplaced, lost, or communicated in an untimely manner.

Overall, throughout the stages of contract preparation and administration, controls concerning construction contract warranties exist and are followed. At the time of contract turnover however, clear cut methods for the transfer of information from the contractor to the ROICC to the PWD have not been established or applied routinely.

2. Summary of NAVFAC Procedures with Respect to Warranty Factors in Public Works Management

Once a PWD accepts custody for a newly constructed facility, the existence of clear cut guidance with respect to warranties and warranty management ends.

The turnover process of newly constructed facilities from the contractor to the PWD is basically controlled by the ROICC. The ROICC initiates final inspections, training, and turnover of maintenance/operation manuals, as-built drawings, and technical information. Although at one of the activities studied the warranty manager kept the PWD personnel actively involved in monitoring construction in progress, none of the activities had developed or used standard procedures whereby project acceptance and information turnover and distribution were planned and monitored by controls such as the checklists used by ROICC offices. In the event the ROICC is untimely or fails to provide required information, the PWD has no sure way of recognizing the deficiency. Likewise, if the ROICC has large quantities of information to turn over, the PWD may not be prepared to accept, review, and distribute it in an orderly manner.

PWD's follow fairly explicit standardized procedures for staffing and assignment of responsibilities within the department. The prescribed methods for maintenance management are clear-cut, well

communicated through publications and manuals, and are followed by each activity. PWD organization and reporting guidance results in facility deficiencies being identified through customer requests or scheduled inspections.

However, policies for identifying warranty deficiencies or enforcing warranty clauses are not consolidated in any guidance used commonly by PWD's in conducting daily operations. The sources of guidance used during the contracting phase of facilities construction projects (e.g. the FAR, P-68, contract clauses, and EFD procedural manuals) contain valuable information pertaining to the Government's rights and responsibilities in enforcing construction contract warranties. However, these sources are not generally used by facilities maintenance management personnel in the performance of their duties. Warranty managers, therefore, tend not to be intimately familiar with the guidance used in managing construction contracts. Nor should they be. Their prime concern and area of expertise is maintenance management and facility upkeep. Even if warranty managers have an in-depth knowledge of contractual requirements and how they pertain to warranties, there is still no guidance available on how to set up, implement, operate, and control a warranty management program. In addition, the Facilities Evaluation and Assistance (FEAT) concept of EFD sponsored facilities management assistance to individual activities does not routinely review, address, or provide advice concerning construction contract warranty management at the activity level. Hence, individual activities approach construction contract warranty management according to their own priorities, philosophies, and abilities.

With no universal warranty management guidance available, individual activities have a good deal of autonomy in their approach to warranty management and in developing local policies and procedures. Specific organization, staffing, and methods for warranty management vary from activity to activity, but some aspects tend to be consistent.

1. The primary warranty manager is either in charge of or closely associated with the maintenance engineering and work control function.
2. The warranty program is managed by using a common-sense, or intuitive approach. Warranty programs tend not to be extensively planned or documented. Management of warranties is done on an informal basis.
3. Activities tend not to pursue contractor resolution of warranty deficiencies unless they are major problems or there is reasonable assurance that contractor response can be obtained with little administrative effort.
4. Compensation for warranty problems corrected with PWD resources is generally not sought from the contractor.
5. Controls are not used to insure all incoming work requirements are screened for warranty applicability.
6. Warranty information is generally held by one or two people in the organization.
7. Newly constructed facilities are not inspected toward the end of the warranty period to identify defects and deficiencies that can be corrected under the provisions of the warranty before it expires.

Despite the apparent lack of formality in and standardization of warranty management procedures, field activities generally enforce warranties in a sensible manner. Warranty deficiencies are not referred to the contractor when the administrative time and cost to secure a contractor response is likely to exceed the cost of resources to resolve the problem in house. Deficiencies that are major in scope and cost are pursued under the provisions of the warranty clauses. However, the lack of warranty management

controls leaves the activity susceptible to these dangers:

1. Unintentionally resolving a major, high cost warranty problem in house.
2. Misinterpreting a major, high cost warranty problem as not being covered under warranty.
3. Resolving numerous minor but repetitious warranty problems with a high net cost inhouse.
4. Failure to identify accelerated wear or deterioration of materials and equipment that have not yet broken down but should be restored to proper operating condition under the provisions of the warranty.
5. Operating or maintaining equipment or materials in such a way that the warranty becomes void, because operation and maintenance manuals were not readily available.

C. RECOMMENDATIONS

1. Recommendations with Respect to Warranties in Contract Administration

As discussed in the previous section, from the contracting aspect, NAVFAC policies concerning construction contract warranties are clear and specific and are followed by contracting field activities. Because a standard warranty clause is used almost universally, Engineering Field Divisions have been able to develop standard procedures and formats for field ROICC offices to use in administering construction contracts.

However, the field investigation phase of this study revealed that during the turnover process of completed construction from the contractor to the using activity, the potential for incorrect, incomplete, or untimely transfer of important warranty information exists. Because of the large volume of information that must be transferred and the importance of the using activity PWD having knowledge of and access to that information immediately upon facility acceptance, increased controls over the turnover process are recommended. Areas to be investigated as a means of

improving control are discussed in the following paragraphs.

Shop drawings, technical submittals, manufacturers' catalog information manuals, operation and maintenance manuals, and specific warranty information should be organized into an orderly, complete "technical package".

A set of as-built drawings should be assembled immediately upon occupancy of completed construction by the using activity or upon turnover and provided to the PWD.

Turnover of the "technical package" and as-built drawings should be formalized in much the same way as final facility inspections are formalized and conducted. Time should be alloted for the contractor, ROICC, and PWD representatives to review and discuss the "technical package" and as-built drawings. This will permit the PWD to have a more complete knowledge of the facilities being turned over and allow for discussion of questions or anticipated problem areas. Knowing how a facility operates ("technical package" turnover) is as important as knowing that it does operate as intended (final inspection).

The Government's rights and responsibilities under the provisions of Clause 60 and procedures for initiating warranty referrals from the PWD to the contractor should be clearly communicated and understood among the contractor, ROICC, and the PWD at the time of turnover.

Transmittal of the formal "turnover package" and communication of Government rights and responsibilities concerning warranties should be accomplished by way of a post-construction meeting. It is standard procedure to conduct a pre-construction meeting at the outset of a contract whereby key ROICC,

contractor, PWD, and others discuss and come to a mutual understanding on their roles, responsibilities, and matters of interest concerning the project. Such meetings go a long way to help construction get off to a smooth start and prevent problems. A post-construction meeting could have a similar benefit of helping the user's operation and maintenance of the new facility get off to a smooth start.

At the end of the warranty period, the contractor's performance with respect to the extent of warranty problems and the contractor's response to warranty referrals should be evaluated. PWD input should be obtained and the contractor's performance evaluation updated as appropriate.

The preceding recommendations could be implemented fairly easily through addenda to the EFD ROICC manuals by each individual EFD. They would serve not as changes to existing policy and desired procedures but as amplifications or clarifications.

2. Recommendations with Respect to Public Works Department Management of Warranties

Presently, Public Works Departments have wide latitude in how to approach management of construction contract warranties, what types of controls to use, and how to implement a warranty management program. It is good to give PWD's such wide latitude, because the amount of management attention required to administer construction contract warranties varies considerably from activity to activity. To mandate specific assignments of responsibilities and procedures would reduce a PWD's independence and ability to manage the overall Public Works function efficiently. Although shortcomings have been identified in the manner in which PWD's manage warranties, it was evident from the field investigation that warranties are usually

enforced when the effort to do so will result in avoidance of substantial repair or modification costs to the Government. When the administrative cost to enforce warranties is likely to exceed the labor and material cost to resolve problems by using PWD resources, enforcement of warranties is not pursued. From the results of the Activity VI warranty program, it may be estimated that PWD's avoid approximately 80% of the total costs to resolve warranty-related problems by putting management emphasis on high-cost problems and those problems that can be resolved with little administrative effort. Since the high cost problems tend to be resolved by the ROICC, PWD's are able to employ this management approach without increasing administrative staffing and overhead. It is, therefore, recommended that the overall approach to warranty management in NAVFAC, to give individual activities autonomy in managing construction contract warranties, remain unchanged. The individual activity has ample incentives through restricted operation and maintenance budgets and competition with commercial vendors to perform PWD functions efficiently. Specific procedures for warranty management need not be dictated to the individual PWD's.

As previously discussed, shortcomings do exist in the way construction contract warranties are managed in the field. To help overcome these shortcomings and to provide added assurance that PWD's do not use large amounts of resources to correct deficiencies that are covered under warranty, warranty management programs should include, to the extent practicable, the elements described in the following paragraphs:

The warranty manager should be familiar with key warranty policies and procedures used during the contracting phase of construction projects. This

includes knowing overall Federal and NAVFAC policies concerning warranties; the Government's rights and responsibilities under the provisions of Clause 60; and contract requirements for as-built drawings, manufacturers' data, shop drawings, operation and maintenance manuals; and the step-by-step process ROICC manuals dictate for turnover of newly completed construction from the contractor to the using activity.

Checklists and procedures should be developed for acceptance of facilities and documents from the ROICC, with clear identification of responsibilities, actions to be taken, and timings.

Key PWD personnel such as work receptionists, shop heads, and personnel conducting facility or equipment inspections should be made conscious of warranties and kept up to date as to what is under warranty. This will help insure thorough screening of work requirements for applicability of warranties.

Personnel who are depended upon for input or action in managing the warranty program should be assigned their responsibilities formally. Performance evaluations should reflect how these assigned responsibilities are carried out.

Warranty managers should document warranty referrals, and set up tickler systems to track contractors responses.

The activity warranty program should be set forth in writing and local policies, procedures, and responsibilities formalized.

Procedures for documenting work performed and back-charging non-responsive contractors for Government corrected warranty deficiencies should be established.

Near the end of the warranty period, a detailed inspection of the construction provided by a contract should be conducted, with the intent of identifying

warranty deficiencies. Emphasis should be placed on deterioration of materials or equipment that has not yet resulted in failure but will cause shortened useful lives.

At the end of the warranty period, contractor performance with respect to warranty referrals should be evaluated and the ROICC advised.

Since the need to follow the preceding steps and the extent to which they should be followed will vary from activity to activity, it is recommended that NAVFAC issue guidance concerning warranty management that is of an advisory nature rather than a regulatory nature. A short, concise warranty manager's handbook should be developed, published, and distributed. The handbook should be geared toward the PWD warranty manager and should include pertinent information concerning general NAVFAC policy, standard contract clauses, how to interface with contractors, ROICC responsibilities, key elements that should be included in a warranty management program, and tips to make warranty programs more effective or easier to manage. The use of checklists, step by step procedures, and standard forms for documentation and correspondence, as is done in EFD published ROICC manuals, should be maximized in order to ease the PWD's task in developing its own program and enhance uniformity from activity to activity. In developing such a handbook, input should be sought from field activities and the best ideas and tips for warranty management should be included.

It is also recommended that warranty management be included as an aspect to be examined during EFD FEAT visits to individual activities. This will help EFD's evaluate how field activities manage warranties, provide a source of new ideas and methods for warranty

management, and serve to assist individual activities in improving their own programs.

By following these recommendations, construction contract warranty management can be improved throughout NAVFAC without imposing undue restrictions or requirements upon individual field activities.

52.246-21 Warranty of Construction.

As prescribed in 46.710(e)(1), the contracting officer may insert a clause substantially as follows in solicitations and contracts when a fixed-price construction contract (see 46.705(c)) is contemplated, and the use of a warranty clause has been approved under agency procedures:

WARRANTY OF CONSTRUCTION (APR 1984)

(a) In addition to any other warranties in this contract, the Contractor warrants, except as provided in paragraph (j) of this clause, that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, or design furnished, or workmanship performed by the Contractor or any subcontractor or supplier at any tier.

(b) This warranty shall continue for a period of 1 year from the date of final acceptance of the work. If the Government takes possession of any part of the work before final acceptance, this warranty shall continue for a period of 1 year from the date the Government takes possession.

(c) The Contractor shall remedy at the Contractor's expense any failure to conform, or any defect. In addition, the Contractor shall remedy at the Contractor's expense any damage to Government-owned or controlled real or personal property, when that damage is the result of—

(1) The Contractor's failure to conform to contract requirements; or

(2) Any defect of equipment, material, workmanship, or design furnished.

(d) The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for 1 year from the date of repair or replacement.

(e) The Contracting Officer shall notify the Contractor, in writing, within a reasonable time after the discovery of any failure, defect, or damage.

(f) If the Contractor fails to remedy any failure, defect, or damage within a reasonable time after receipt of notice, the Government shall have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the Contractor's expense.

(g) With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall—

(1) Obtain all warranties that would be given in normal commercial practice;

(2) Require all warranties to be executed, in writing, for the benefit of the Government, if directed by the Contracting Officer; and

(3) Enforce all warranties for the benefit of the Government, if directed by the Contracting Officer.

(h) In the event the Contractor's warranty under paragraph (b) of this clause has expired, the Government may bring suit at its expense to enforce a subcontractor's, manufacturer's, or supplier's warranty.

(i) Unless a defect is caused by the negligence of the Contractor or subcontractor or supplier at any tier, the Contractor shall not be liable for the repair of any defects of material or design furnished by the Government nor for the repair of any damage that results from any defect in Government-furnished material or design.

(j) This warranty shall not limit the Government's rights under the Inspection and Acceptance clause of this contract with respect to latent defects, gross mistakes, or fraud.

(End of clause)

(R 7-604.4 1976 JUL)

Alternate I (APR 1984). If the Government specifies in the contract the use of any equipment by "brand name and model", the contracting officer may add a paragraph substantially the same as the following paragraph (k) to the basic clause:

(k) Defects in design or manufacture of equipment specified by the Government on a "brand name and model" basis, shall not be included in this warranty. In this event, the Contractor shall require any subcontractors, manufacturers, or suppliers thereof to execute their warranties, in writing, directly to the Government.

(AV 7-604.4(b) 1976 JUL)

FOR OFFICIAL USE ONLY *(When data entered)*

CONSTRUCTION CONTRACTOR PERFORMANCE EVALUATION REPORT	REPORT CONTROL SYMBOL

1. NAME AND ADDRESS OF CONTRACTOR *(Include ZIP Code)*

2. DESCRIPTION AND LOCATION OF WORK

SECTION I - CONTRACT DATA

3. GENERAL	4. FISCAL	5. TIME
a. CONTRACT NUMBER	a. AMOUNT OF BASIC CONTRACT	a. DATE OF AWARD
b. TYPE OF CONTRACT ☐ ADVERTISED NEGOTIATED: ☐ CPFF ☐ FIRM FIXED PRICE ☐ OTHER *(Specify)*	b. TOTAL AMOUNT OF MODIFICATIONS	b. ORIGINAL CONTRACT COMPLETION DATE
	c. LIQUIDATED DAMAGES ASSESSED	c. REVISED CONTRACT COMPLETION DATE
	d. NET AMOUNT PAID CONTRACTOR	d. DATE WORK ACCEPTED
c. COMPLEXITY OF WORK ☐ DIFFICULT ☐ ROUTINE	6. TYPE AND EXTENT OF SUBCONTRACTING	

SECTION II - PERFORMANCE EVALUATION OF CONTRACTOR *(Check appropriate column)*

7. PERFORMANCE ELEMENTS	SATISFACTORY	UNSATISFACTORY
a. CONTRACTOR QUALITY CONTROL		
b. TIMELY PERFORMANCE		
c. EFFECTIVENESS OF MANAGEMENT		
d. COMPLIANCE WITH LABOR STANDARDS		
e. COMPLIANCE WITH SAFETY STANDARDS		

8. OVERALL EVALUATION *(IF UNSATISFACTORY, EXPLAIN EVALUATION IN ITEM 11, ON REVERSE)*
☐ SATISFACTORY ☐ UNSATISFACTORY

9. EVALUATED BY

a. TYPED NAME AND TITLE	b. SIGNATURE
c. ORGANIZATION	d. DATE

10. EVALUATION REVIEWED BY

a. TYPED NAME AND TITLE	b. SIGNATURE
c. ORGANIZATION	d. DATE

DD FORM 1 FEB 74 1596
S/N 0102-LF-001-5960

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FOR OFFICIAL USE ONLY *(When data entered)*

11. EXPLANATION OF UNSATISFACTORY EVALUATION - FOR EACH UNSATISFACTORY ELEMENT, PROVIDE FACTS CONCERNING SPECIFIC EVENTS OR ACTIONS TO JUSTIFY THE EVALUATION *(e.g., extent of Government inspection required, rework required, subcontracting, cooperation of contractor, quality of workmen and adequacy of equipment)*. THESE DATA MUST BE IN SUFFICIENT DETAIL TO ASSIST CONTRACTING OFFICERS IN DETERMINING THE CONTRACTOR'S RESPONSIBILITY. *(Continue on separate sheet, if needed)*

12. REMARKS ON OUTSTANDING PERFORMANCE - AS INDICATED BY THE CONTRACTOR'S PERFORMANCE ON THIS CONTRACT, IF YOU CONSIDER THE CONTRACTOR TO BE OUTSTANDING, SET FORTH FACTUAL DATA SUPPORTING THIS OBSERVATION. THESE DATA MUST BE IN SUFFICIENT DETAIL TO ASSIST CONTRACTING OFFICERS IN SELECTING CONTRACTORS THAT HAVE DEMONSTRATED OUTSTANDING QUALITY OF WORK AND RELIABILITY. *(Continue on separate sheet, if needed)*

LETTERHEAD

CUSTOMER WARRANTY PROBLEM LETTER

MEMORANDUM

From: Resident Officer in Charge of Construction, San Diego
To: _____

Subj: Warranty Work for Contract N62474-___-C-_____; action taken regarding

1. This office was notified on _____ that the following discrepancy exists:

2. This office investigated the problem on _____ and contacted the responsible contractor by (telephone/letter) on _____ requesting corrective action be taken immediately.

A. B. SMART
CDR, CEC, USN

Copy to:
OICC _____

Blind copy to:
Con Rep
General File
Reading File

LETTERHEAD

CONTRACTOR WARRANTY PROBLEM LETTER

Contractor Name
Address

Subj: Contract N62474-_____

Gentlemen:

You are requested to correct the following discrepancies for the subject contract under the warranty clause:

a. _____
_____
_____.

If you have any questions concerning the above list, please contact _____ at _____, telephone _____.

Please notify this office in writing of your intended action and when the deficiencies are corrected.

Sincerely yours,

A. B. SMART
CDR, CEC, USN
ROICC San Diego

4.2 POST AWARD

4.2.33 PROJECT CLOSEOUT (Cont'd)

4.2.33.6 ROICC CONTRACT CLOSEOUT CHECKLIST

A. Before Final Acceptance	Target Date	Date Complete
1. Pre-final Inspection		
2. Fire Protection Inspection (EFD)		
3. Hoists & Cranes Inspection (EFD)		
4. Elevators Inspection (EFD)		
5. Boiler Systems Inspection (EFD)		
6. BOD/Useable Completion Date		
7. Final Inspection (Contr/PW/User)		
8. Final Completion Date (Punchlist)		
9. Release Letter to Activity		
10. Completion Letter to Contractor		
11. All Quality Control Deficiencies Corrected		
12. Operating Tests PLerformed and Witnessed		
13. Training Sessions Scheduled and User Notified		
B. Before Final Release		
1. List of Warranty Agents to PW/Customer		
2. As-built Drawings Provided and Accepted.		
3. O & M Manuals to Using Agency		
4. Shop Drawings to PW		
5. Keys to PW/User		
6. Spare Parts to PW		
7. GFE/GFM Accounted for		
8. Salvaged Materials/Equipment Turned In		
9. Determine Status of Utility Bill		
10. All Claims Settled		
11. All Change Orders Finalized		
12. Liquidated Damages Assessed (if applicable)		

4.2 POST AWARD

4.2.33 PROJECT CLOSEOUT (Cont'd)

4.2.33.6 ROICC CONTRACT CLOSEOUT CHECKLIST (Cont'd)

B. Before Final Release (Cont'd)	Target Date	Date Complete
13. Warranty Letter to Contractor	_____	_____
14. As-built Record of Materials (if required) Received and Forwarded to User	_____	_____
15. Subsequent Warranty/Performance Period Retesting and/or Maintenance Scheduled	_____	_____
16. Spare Parts to User (if required)	_____	_____
17. Equipment Serial Numbers Checked Against Documentation	_____	_____
18. Warranties, Safety Precautions, Operating Instructions, Etc., Posting Verified	_____	_____
19. Final Payrolls and Labor Provisions Received and Verified	_____	_____
20. Final Invoice/Release(s) Received	_____	_____
C. Before Closing Out File		
1. Final Progress Photos	_____	_____
2. Contractor Evaluation to EFD (DD 1596)	_____	_____
3. A/E Evaluation to EFD (DD 1413)	_____	_____
4. As-Built Drawings to EFD	_____	_____
5. Final Payment Processed	_____	_____

From: Resident Officer in Charge of Construction

To: Commanding Officer,

Subj: Contract N62474- -C-

Encl: (1) Final Inspection Report dtd
(2) ROICC, NAS Moffett Field, CA ltr

1. Based upon the final inspection held on _____, the subject contract was determined to be usably complete on _____ and is released for the purpose of beneficial occupancy. Final acceptance of the facility will be subject to correction of any deficiencies noted in enclosure (1). Notwithstanding final acceptance, the one year warranty period commenced on _____ , the usable completion date. Although the warranty covers defective materials and equipment, routine maintenance must be accomplished by the user to keep the warranty in effect.

2. Should discrepancies appear during the warranty period, the contractor should be contacted directly at the following address:

Contractor's Name _____
Address _____

Enclosure (2) is a copy of the letter to the contractor establishing the warranty period. If a dispute arises with the contractor concerning warranty repairs, the ROICC SFBA should be contacted for assistance.

3. It is requested that your acceptance of this facility be acknowledged by signature below, and that a signed copy be returned to the ROICC SFBA for record purposes.

ROICC signs

Accepted by:

_____
(Signature and Title)

Copy to:
OICC, _____

Name of Contractor
Address

Subj: Contract No. _____

Gentlemen:

In accordance with the contract clauses, the Government has taken possession of (the following portion of) your contract No. _____ (Name) _____.

Construction deficiencies noted at the final inspection were: (List) (or shown on attached list); (or) No construction deficiencies were noted at the final inspection.

The contract warranty period for the above-mentioned facilities commenced as of _____ (Date) _____. You will be contacted by the using activity concerning warranty corrections, if any are required. It is the responsibility of the contractor to determine if the corrections requested are actual warranty matters and take immediate corrective action if determined to be contractor responsibility. If the contractor determines that corrections requested are not contractor responsibility, a reply to the user should be expedited. If warranty matters cannot be resolved expeditiously, you will be contacted by this office.

Sincerely,

LIST OF REFERENCES

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8. U.S. Department of Defense, DOD INST 4165.64 DOD Real Property Maintenance Activities Program, May 23, 1985.

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15. U.S. Department of the Navy, Naval Facilities Engineering Command Navy Civil Engineer Corps Zero Base Study, Dec 1986.

16. U.S. Department of the Navy, Naval Facilities Guide Specification NFGS-01011, Additional General Paragraphs, p.16, Mar 1985.

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